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# THE TRANSPORT OF LIQUID INDUSTRIAL WASTE IN ONTARIO

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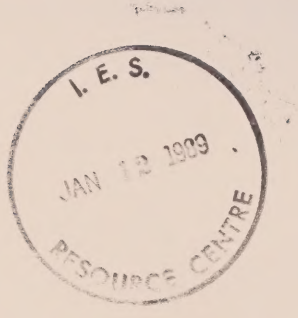


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# THE TRANSPORT OF LIQUID INDUSTRIAL WASTE IN ONTARIO

R. A. C. PROJECT NO. 293 PL

Prepared For
Ontario Ministry of the Environment

NOVEMBER 1987

By

A.R.A. CONSULTANTS

87018

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# THE TRANSPORTATION OF LIQUID INDUSTRIAL WASTE IN ONTARIO

## ABSTRACT

This study describes the economic, financial and structural characteristics of the liquid waste haulage industry in the province. The data sources include Statistics Canada, government reports, trade journals and interviews with selected industry representatives and operators. "Liquid industrial waste" includes all liquids which are subject to Regulation 309, including hazardous liquid wastes.

Statistics Canada data for a sample of 5 "for-hire" carriers indicate that, approximately, 90% of all revenues were derived from routes in excess of 25 km within the province. The average firm has total fixed assets of $1.4 million and shareholders' equity of less than $500,000. Our analysis also suggests that the industry is relatively small and not as well capitalized as other segments of the trucking industry in Ontario.

Southwest Ontario accounts for 40% of all tonnage shipped with the west central region accounting for an additional 29%. Average tonnage per firm in the province was 8,971 per year. For the province as a whole, the three largest firms account for 29% of all tonnage and 17% of all shipments.

The transportation of liquid industrial waste is extremely competitive on the basis of price. The price varies due to three key factors: type of materials handled; distance travelled; and nature of the equipment required.

Several of the smaller firms are merging or being bought out in the wake of a general rationalization taking place in transportation and trucking in particular. There is a movement towards more integration into "downstream" operations, i.e. disposal sites.

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## THE TRANSPORTATION OF LIQUID INDUSTRIAL WASTE IN ONTARIO: EXECUTIVE SUMMARY

This report examines the economic, financial and structural characteristics of the liquid waste haulage industry in Ontario. The study researches a number of issues such as: size; regional characteristics; degree of integration; financial strength; and the influence of regulatory factors on financial operations. The data sources include Statistics Canada, government reports, trade journals and interviews with selected industry representatives and operators.

### Definitions and Regulations Affecting Transportation

Our definition of "liquid industrial waste" includes all liquids which are subject to Regulation 309, including hazardous liquid wastes. The transportation of dangerous wastes is regulated by the federal and provincial authorities. Federally, the Transportation of Dangerous Goods Act (TDG) contains specific requirements for tracking waste by means of shipment manifests, and prescribes safety procedures. The Ontario Dangerous Goods Transportation Act is administered by the Ministry of Transportation and Communications. The Ministry of the Environment (MOE) is responsible for controlling the flow of all wastes under Regulation 309, which establishes a monitoring system from origin to disposal, a registration system for generators, and an approvals system for carriers and receivers of subject waste. According to the MOE data gathered to date, we estimate that about 650,000 to 700,000 tonnes of subject liquid waste is shipped in the province annually.

### Financial Analysis of the Industry

Our analysis is based on a special tabulation by Statistics Canada on liquid industrial waste carriers in Ontario in 1985. The carriers in this sample hauled a broad range of commodities in addition to liquid waste.

Approximately 90% of all revenues were derived from routes in excess of 25 km within the province. The average firm has total fixed assets (fully depreciated) of $1.4 million and shareholders' equity of less than $500,000. The industry is relatively small and not as well capitalized as other segments of the trucking industry.

**Industrial Structure: Operational and Regional Characteristics**

Southwest Ontario accounts for 40% of all tonnage shipped with the west central region accounting for an additional 29%. Average tonnage per firm in the province was 8,971 per year.

There is a clear dichotomy with half of the firms registered to do so heavily engaged in hauling liquid industrial waste and the other half hardly at all; this suggests the nature of transporting "specialized waste" products. The specialization required is evident by the fact that the industry must "dedicate" certain equipment for particular types of waste.

**Market Concentration and Market Segments**

The three largest carriers in each region of the province account for a disproportionately large share of tonnage and total shipments. For the province as a whole, the three largest firms account for 29% of all tonnage and 17% of all shipments. The integrated carriers (firms which both generate and transport waste) account for 53% and 63% of total waste carried in the two biggest regions, the southwest and west central regions. Collectively, the integrated firms carry 10% more waste than they generate and are increasingly moving more "downstream" as they diversify to become operators of disposal or treatment sites.

**Transportation Costs and Fees**

The transportation of liquid industrial waste is extremely competitive on the basis of price. For generators, the removal of waste without recovery potential is an unproductive cost of doing business and they therefore look to the lowest cost of service, bearing in mind quality (safety) considerations.

Since the industry does not file a tariff, our information on fees must rely on previous studies which indicate that the cost of for-hire haulage can vary from $55.00 to $100.00 per hour. The price may vary due to three key factors: type of material handled; distance travelled; and nature of the equipment required.

There is no valid way of determining what volume of waste in general is "economic" to haul. For some materials the generator will pay the carriers to dispose of waste; for other products, the carriers will pay the generator; it all depends on the market value for the waste product in question. Transportation operators are astute business people who display a high degree of entrepreneurism in their operations.

**Other Factors Affecting the Industry**

No data exists on entry to and exit from the industry hauling liquid industrial waste. Entry is difficult due to the high cost of capital, time required to receive operating licenses, and the need for skilled managers and well-trained operators. Rather than exiting directly from the industry, some firms are merging or being bought out in the wake of a general rationalization taking place in transportation, and trucking, in particular.

There is a movement toward more integration into "downstream" operations, i.e., disposal sites. This offers the carrier the opportunity of charging both for the haulage and disposal of waste, especially as the number of acceptable disposal sites diminishes with time.

# 1. INTRODUCTION

The Government of Ontario has always had an interest in the technical and environmental issues surrounding the transportation of hazardous and other industrial wastes. An important and to date undocumented dimension to the setting of public policy in this area lies in the financial, economic and structural characteristics of the industry, and how these characteristics affect transportation operators. A variety of environmental and safety regulations affect the costs of moving and disposing of industrial waste. These regulations have a fundamental impact upon the industry's profits, rates of return and, possibly, the very nature of the way an individual operator's business is conducted.

The purpose of this study is to determine the economic, financial, and structural characteristics of the **liquid** waste haulage industry in Ontario. The selection of liquid waste carriers as the exclusive subject of the study raised a number of methodological and data problems which were not apparent initially to either the Ministry of the Environment, or the consultants. In retrospect, the separation of liquid waste carriers from other "subject waste" carriers (see Section 2) was not desirable for this particular study. Little enough is known about the structure and operation of subject waste carriers at large to make that more general study preferable to this more specialized study. Nevertheless, this report attempts the most thorough description of the liquid waste transportation sector yet prepared.

This study researches a number of key issues related to the structure and performance of the industry, including:

- size characteristics;
- regional characteristics (e.g., how the industry differs in northern regions compared to that in the "golden horseshoe");

- o the extent of vertical integration (i.e., transporters with generators, and with disposal site operators);
- o the financial health of the industry, including profitability and debt/equity levels;
- o the extent of entry to and exit from the industry in recent years;
- o the economic factors which influence decisions to introduce new technology;
- o how fees are determined and how price competitive the industry is; and
- o how provincial and federal environmental and licensing regulations will likely affect financial performance.

Originally, the terms of reference proposed that the study rely primarily on data collected through interviews with generators and transport operators in the various regions. To this end, we approached the Ontario Trucking Association (OTA) to assist us in collecting data in a survey of a sample of members who specialize in the transportation of liquid industrial waste. A.R.A. met with the OTA's liquid waste carriers' sub-group to explain the study, and found marked and eloquent opposition to it from its members. Apparently, members had previously participated in another study commissioned by a provincial agency and had been displeased with how it had been used.

After a long discussion, the OTA's liquid waste carriers agreed to participate conditionally in our study, and subsequently both provided us with a list of some 32 members, and encouraged their membership to cooperate with us by providing basic information. The data from the questionnaire was to be delivered to the OTA on a confidential basis and the OTA was to aggregate the data so that no specific corporate information would be given

to the consultants. The questionnaire was sent out in April, 1987. Only 3 replies were received by the OTA, and follow-up discussions with OTA staff revealed that for its individual members were very reluctant to provide financial and economic data for this study for the same reasons that the OTA had initially stated.

Accordingly, we were forced to alter our research methods; after meeting with the Ministry of Environment's project Steering Committee to discuss the problems encountered with the survey, it was agreed that we would seek information from the following sources:

- Statistics Canada;
- government reports and original sources within government files;
- private consultant reports;
- articles from trade journals; and
- a limited number of interviews with industry representatives, and operators (where possible) and relevant government officials to corroborate our findings from other sources.

In adopting this approach, we were aware of the spotty nature of data in the public domain (e.g., Statistics Canada), and also that the interviews would contain considerable anecdotal evidence rather than "hard" information. Despite the fact that we were not able to carry out our original questionnaire, we nevertheless believe that the analysis in this report is useful for future policy making.

## 2. DEFINITIONS AND DESCRIPTION OF THE REGULATORY SYSTEM

One of the methodological problems we encountered with this study arose from singling out liquid industrial waste from other "subject" or "manifestable" wastes. The data available on waste quantities does not specify if they are liquid wastes or solid hazardous wastes. Both types are subject to the Ministry of Environment's Regulation 309. Likewise, carrier certification data does not accurately specify the liquid/solid composition of wastes which a carrier or a generator is registered for (see Section 2.1 below). It is apparent from our research that many liquid waste transportation operators also haul solid hazardous (i.e., also "subject waste") commodities. In addition, many are generators themselves, or receivers. (We describe the various segments of the transportation sector later in the report.) In hindsight then, it would have been more appropriate to consider an integrated approach to the generation, transport and treatment of wastes, rather than singling out one aspect of it in isolation.

At this point, it is necessary to define the terms used in this study, and (in the next subsection), to describe in general the provincial system of regulation which affects liquid waste carriers. In the final subsection we describe the "manifest" system for tracking wastes, and estimate the quantity of manifested subject liquid waste handled annually in Ontario.

According to Regulation 309, "subject waste" means liquid industrial waste, and hazardous waste. "Liquid industrial waste" (according to Paragraph 38 of Section 1) means waste that is both liquid waste and industrial waste but does not include:

- hauled sewage;
- waste from the operation of a sewage works;
- waste from the operation of a water works subject to the Ontario Water Resources Act;

- o waste that is produced in any month in an amount less than twenty-five litres or otherwise accumulated in an amount less than twenty-five litres;
- o waste directly discharged by a generator from a waste generation facility into a sewage works subject to the Ontario Water Resources Act or established before the 3rd day of April, 1957 or into a sewage system, as defined in Part VII of the Act;
- o waste that results directly from food processing and preparation operations, including food packing, food preserving, wine making, cheese making and restaurants;
- o drilling fluids and produced waters associated with the exploration, development or production of crude oil or natural gas;
- o processed organic waste; or
- o asbestos waste.

"Hazardous waste" (according to Paragraph 27 of Section 1) means a waste that is a:

- o hazardous industrial waste;
- o acute hazardous waste chemical;
- o hazardous waste chemical;
- o severely toxic waste;
- o ignitable waste;
- o corrosive waste;
- o reactive waste;
- o radioactive waste, except radioisotope wastes disposed of in a landfilling site in accordance with the written instructions of the Atomic Energy Control Board;
- o pathological waste;

- o leached toxic waste; or
- o PCB waste as defined in Ontario Regulation 11/82

and includes a mixture of acute hazardous waste chemical, hazardous waste chemical, hazardous industrial waste, pathological waste, radioactive waste or severely toxic waste and any other waste or material. (Paragraph 27 goes on to list a number of exempted wastes.)

As "subject" wastes are defined, then, it is obvious that some hazardous wastes may be in liquid form. It is thus virtually impossible at this level of study to determine whether a liquid waste hauled by a carrier is classed as a "liquid industrial waste", or a "hazardous waste". Consequently we have utilized a looser definition in our analysis than that included in Regulation 309. We have generally considered all liquids which are subject to Regulation 309. This is convenient for this study because all such liquids require liquid handling equipment (e.g. tankers, vacuum trucks, drums, etc.). In assessing fleet size and structure, the presence of liquid handling equipment is the most telling indicator that a subject waste carrier is a liquid waste carrier.

## 2.1 REGULATORY FRAMEWORK

The transportation of dangerous waste--whether solid or liquid--is regulated by federal and provincial transport of dangerous goods legislation, which was developed subsequent to the near-disastrous Mississauga train derailment in 1979. In 1980, for the first time, regulations covering the handling and transportation of dangerous goods by road, rail, water and air were promulgated under a single law, the federal **Transportation of Dangerous Goods Act** (TDG).

The TDG Act is administered by Transport Canada. The Act contains specific requirements for the tracking of dangerous waste goods by means of shipment manifests, which must accompany all dangerous waste goods. Shipments of either liquid or solid waste which exceeding 5 litres or 5 kg must have such

a manifest. The Act also requires the carrier to develop an "Emergency Response Plan" for the particular waste covered by the manifest.

Nine classes of dangerous goods are categorized by the TDG Act. Prescribed safety marks must be visible on all packages, containers, tanks, cylinders and road/rail vehicles, for all shipments of dangerous goods. The Act places responsibility upon the generator/consignor of the waste to ensure that the transporter utilizes the proper markings. It is the transporter's responsibility, however, to ensure that all employees are trained or operate under the supervision of a trained person.

While it imposes a degree of uniformity on the provinces in the way it deals with international and interprovincial movements of dangerous goods, the Federal Act allows for the promulgation of specific provincial regulations covering the transportation within provincial jurisdiction of dangerous goods in general. The **Ontario Dangerous Goods Transportation Act**, covering highway transportation of wastes, is administered by the Ministry of Transportation and Communications. Its specific terms are identical to federal regulations.

The Ontario Ministry of Environment is responsible for controlling the flow of hazardous and liquid industrial **wastes**. Its controlling instrument is "Regulation 309 (General--Waste Management)", issued under the **Environmental Protection Act**. Regulation 309 clearly lays out the system to control wastes in the province. The main thrusts of the Regulation are:

- o establishment of a system to monitor wastes from origin to disposal, via a shipment manifest for all subject wastes; and
- o registration requirements for generators, and certification requirements (under part V of the Environmental Protection Act), for carriers and receivers of subject wastes.

According to Regulation 309, all subject waste generators, and all the wastes they produce, must be registered with the Ministry of the Environment. All

waste carriers must be certified by the Ministry, and must meet specific performance and driver training requirements. Ministry of Environment officials indicate that there are in excess of 400 certified carriers in Ontario.

Finally, all receivers of liquid industrial and hazardous wastes must be certified to receive those particular kinds of waste. It is the generator's responsibility to ensure that all wastes are shipped by a certified carrier, authorized and equipped for the transport of the specific waste, to a certified receiver, authorized and equipped for the receipt of that specific waste. A shipment manifest documents each transfer. The next section describes Ontario's tracking system in detail.

## 2.2 THE MANIFEST SYSTEM AND "SUBJECT WASTES" ESTIMATING LIQUID WASTE QUANTITIES

The means of ensuring cradle-to-grave tracking of subject wastes is via the manifest system of documenting waste transfers. Ontario was the first of the provinces to institute such a system provincially. The system it established clearly defines the responsibilities and reporting requirements of all approved waste generators, transporters, and receivers of all specified subject wastes--i.e., all hazardous wastes (liquid or solid) and all liquid industrial wastes.

All subject wastes must be accompanied by a shipment manifest (see Appendix 1). In theory, the Ministry can track all waste shipments from source to final disposal/treatment. The Ministry has completed computerizing its manifest records and the reality will eventually be close to the theory. At the present time, the Ministry's records contain a wealth of raw data on annual shipments and quantities of waste generated and carried. Table 1 indicates the kinds of wastes handled by carriers in 1986, by destination ("receiver") and quantity. Appendix 2 describes in detail the subject waste classification system used by Ontario. In 1986, 920,951 tonnes of liquid industrial and hazardous wastes were hauled in Ontario.

It is difficult to disaggregate liquids from solids. "Solutions" and "slurries" are classed as liquid waste, while "sludges" or "residues" may or

**TABLE 1**
**QUANTITIES OF LIQUID INDUSTRIAL & HAZARDOUS WASTES**
**(i.e. Subject Wastes), BY DESTINATION, ONTARIO 1986**
**(Tonnes)**

| Waste Class | Landfill | Private Landfill | Incin-eration | WPCP | Transfer Station | Out of Prov. | Reclam-ation | Dust Suppr. | Misc. | Total | % of Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Acid Solutions | 4,118 | 0 | 1,783 | 12,234 | 15,968 | 10,212 | 21,856 | 360 | 2,305 | 68,836 | 7% |
| Alkaline Solutions | 4,370 | 5,444 | 5,472 | 5,123 | 5,340 | 2,386 | 6,648 | 20 | 126 | 34,929 | 4% |
| Aqueous Salts | 25,874 | 3,627 | 1,671 | 199 | 1,386 | 1,045 | 111 | 0 | 12 | 33,925 | 4% |
| Misc. Inorganic & Mixed Wastes | 40,966 | 7,203 | 4,355 | 177,827 | 18,547 | 7,163 | 4,716 | 0 | 2,933 | 263,710 | 29% |
| (of which: Leachate) | 0 | 0 | 0 | (174,128) | 0 | (15) | 0 | 0 | 0 | (174,143) | (19%) |
| Non-halogenated Spent Solvents | 332 | 0 | 17,176 | 1,103 | 10,137 | 5,717 | 21,975 | 2 | 78 | 56,520 | 6% |
| Fuels | 2,899 | 562 | 843 | 555 | 1,838 | 125 | 1,303 | 33 | 112 | 8,273 | 1% |
| Resins & Plastics | 1,867 | 5,536 | 1,900 | 119 | 2,288 | 186 | 897 | 0 | 2 | 12,795 | 1% |
| Halogenated Organic Wastes | 244 | 6,846 | 929 | 0 | 11,165 | 1,143 | 5,673 | 0 | 31 | 26,031 | 3% |
| (of which: PCBs) | 0 | 0 | 0 | 0 | (9,767) | 0 | (11) | 0 | (1) | (9,779) | (1%) |
| Oily Wastes | 6,965 | 11,512 | 7,625 | 28,872 | 40,332 | 8,643 | 94,965 | 19,782 | 10,401 | 229,097 | 25% |
| Misc. Organic & Mixed Wastes | 8,664 | 7,838 | 13,515 | 69,485 | 3,263 | 1,718 | 545 | 54,250 | 4,165 | 163,443 | 18% |
| Processed Organic Waste from Transfer Station | 42 | 0 | 14,251 | 0 | 2,641 | 1,307 | 413 | 0 | 0 | 18,654 | 2% |
| Plant, Animal Wastes | 9 | 85 | 773 | 11 | 1,514 | 2,277 | 0 | 0 | 1 | 4,670 | 1% |
| Other Wastes | 30 | 0 | 0 | 0 | 1 | 19 | 0 | 0 | 18 | 68 | 0% |
| Total | 96,380 | 48,653 | 70,293 | 295,528 | 114,420 | 41,941 | 159,102 | 74,447 | 20,187 | 920,951 | 100% |
| % of Grand Total | 10% | 5% | 8% | 32% | 12% | 5% | 17% | 8% | 2% | 100% | |

WPCP = Water pollution control plant
Misc. = Unclassified receiver types.

Source: Ministry of Environment, Waste Management Branch, Manifest Information System.

may not be. A "slump test" measures the ability of a waste to flow; if it passes the test it is technically a liquid waste, although it might generally be termed a "sludge" whether it passes or not. Nevertheless, some materials listed in Table 1 are obviously in liquid form. "Oily Wastes (#251 to 254) comprise 25% of all hauled subject wastes. Landfill leachate (#149) comprises 19% of subject wastes. Neither of these wastes pose significant hauling or handling problems, beyond their sheer volumes.

Virtually all leachate is destined for water pollution control plants, while oily wastes are sent to many destinations, reclamation being the most common end use. Other obvious liquid wastes are acid and alkaline solutions (#111 to 114, and 121 to 123), which together account for 11% of subject wastes, and spent solvents and fuels (#211 to 213 and 221-222) which account for 7% of wastes. These liquids alone total 62% of all subject wastes. If only part of the remaining wastes are liquid, we can estimate that about 70-75% (650,000 to 700,000) tonnes of subject waste transported in Ontario are in liquid form. This estimate differs from that by Proctor and Redfern in 1982.* Our estimate is for shipped waste; in addition, subject waste definitions, waste classes and reporting requirements have changed since 1982.

This estimate is corroborated by examination of the **destination** of wastes. The most common receivers of wastes are water pollution control plants (32% of wastes); if all wastes which are reclaimed or used in dust suppression (17% and 8%, respectively) are in liquid form, and only part of the remaining wastes are as well, we can assume that the estimate of 650,000 to 700,000 tonnes/year of transported subject liquid waste is valid.

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* Proctor & Redfern, 1982. Waste Quantities Study. Prepared for Ontario Waste Management Corporation.

A few additional observations need to be made about Table 1: although 920,951 tonnes of subject waste were hauled, this does not represent the actual amount originally generated in Ontario, for a number of reasons:

- the "transfer station" column constitutes a double entry because wastes received at a transfer station are counted as originating at that station when they are ultimately shipped to their final destination;
- wastes originating out-of-province but destined for disposal/treatment in Ontario are covered by shipment manifests; and
- significant quantities of subject waste are disposed of on the generator's site; such wastes must still be registered as subject waste, even though a carrier is not engaged in transporting it off-site.

This latter point is explained by Figure 1. In this study, the carriers we examined are engaged only in hauling off-site as per waste streams 3, 6 and 7. Only these transfers must be documented by a manifest.

## 3. FINANCIAL ANALYSIS OF THE INDUSTRY

This section outlines our findings as to the financial and economic state of the liquid waste transfer industry. It begins with a general overview of motor carriers in Ontario, followed by analysis of a sample of known subject and liquid waste carriers.

### 3.1 OVERVIEW OF MOTOR CARRIER FINANCIAL STATISTICS

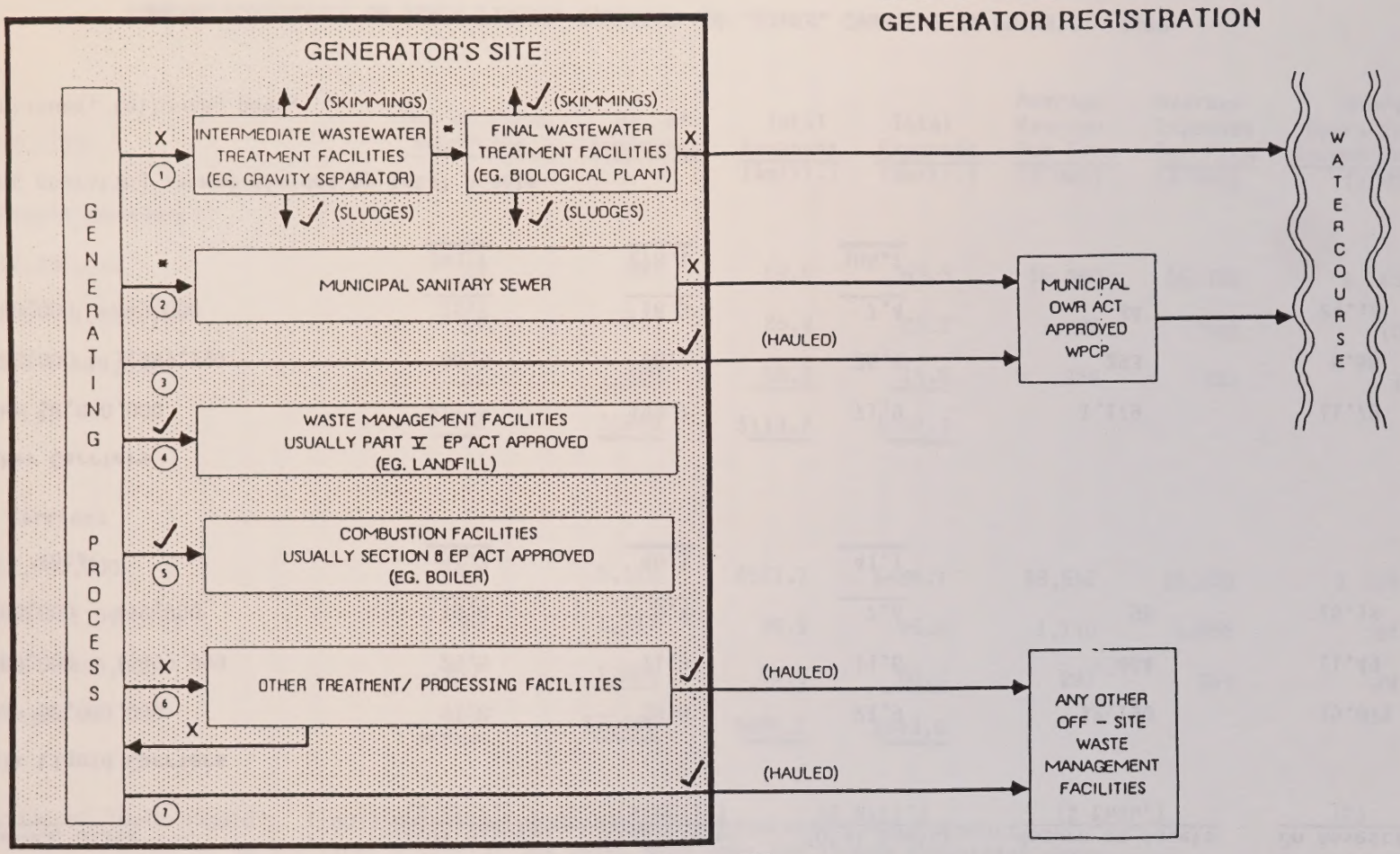
In Tables 2 and 3, we present overall financial data for both bulk liquid carriers and all "other" carriers, as defined by Statistics Canada. Bulk liquid carriers include liquid petroleum products and refrigerated liquid products (e.g., milk). We include them here because Statistics Canada indicated to us that some liquid waste carriers inadvertently place themselves in this category. If spotted by Statistics Canada, these firms are reclassified as "other"; some are not spotted. In addition, bulk liquid carriers require specialized fleets similar in some characteristics to those of liquid waste carriers. The "other" carrier class includes auto carriers, agricultural commodities, building materials, mine ores and non-specified commodities; the latter category includes industrial liquid waste carriers.

The data are arranged according to the basic revenue classes:

- **Class 1:** over $2 million in annual revenues;
- **Class 2:** $500,000 - 1,999,999 in annual revenues;
- **Class 3:** $100,000 - 499,000 in annual revenues.

Turning to Table 2, we see that the majority of bulk liquid carriers (77 of a total of 112 reporting firms) have revenues of between $100,000 to $499,000. The average net operating income in this revenue class is $32,000 in 1985, compared to $108,000 for Class 2 and $630,000 for Class 1. Similarly, Class 3 firms, on average, have equity equalling only $99,000, compared to average equity capitalization of $464,000 for Class 2 and $2,190,000 for Class 1.

## WASTE STREAMS REQUIRING GENERATOR REGISTRATION




X – No Registration Required
✓ – Hazardous, LIW, & RSW Registration Required
• – Only Hazardous Waste Registration Required

WPCP – Water Pollution Control Plant
LIW – Liquid Industrial Waste
RSW – Registerable Solid Waste

NOTE:
Small quantity exemptions apply to all of the above situations. Any of the above on-site management facilities producing wastes (sludges, skimmings, etc.) become generating facilities and resulting wastes may be subject to registration based on destination.

Source: Waste Management Branch of the Ontario Ministry of the Environment

TABLE 2

SUMMARY STATISTICS ON "BULK LIQUID" CARRIERS AND "OTHER" CARRIERS IN ONTARIO - 1985

| Revenue Class | Total Assets ($ mill.) | Total Liabilities ($ mill.) | Total Equity ($ mill.) | Average Equity Per Firm of Return on Assets ($ thou.) | Average Rate of Returns On Assests* (%) |
|---|---|---|---|---|---|
| **Bulk Liquid Carriers** | | | | | |
| Over $2,000,000 | 41.8 | 19.8 | 21.9 | $2,190 | 15.07% |
| $500,000 - 1,999,999 | 23.5 | 11.9 | 11.6 | 464 | 11.49 |
| $100,000 - 499,900 | 16.0 | 8.4 | 7.6 | 99 | 15.19 |
| Total | 81.3 | 40.1 | 41.1 | | |
| **Other Carriers** | | | | | |
| Over $2,000,000 | 271.5 | 199.7 | 71.9 | 1,179 | 11.79 |
| $500,000 - 1,999,999 | 86.5 | 60.1 | 26.4 | 293 | 5.66 |
| $100,000 - 499,000 | 25.7 | 18.3 | 7.4 | 34 | 24.12 |
| | 383.7 | 278.1 | 105.7 | | |

*Net operating income divided by total assets.

Continued, following page.

TABLE 2 (Continued)

SUMMARY STATISTICS ON "BULK LIQUID" CARRIERS AND "OTHER" CARRIERS IN ONTARIO - 1985

| Revenue Class | No. of Firms Reporting | No. of Employees | Total Revenues ($mill.) | Total Expenses ($mill.) | Average Revenue Per Firm ($'000) | Average Expenses Per Firm ($'000) | Average Operating Net Income Per Firm ($'000) |
|---|---|---|---|---|---|---|---|
| **Bulk Liquid Carriers** | | | | | | | |
| Over $2,000,000 | 10 | 697 | 69.6 | 63.3 | $6,960 | $6,330 | $ 630 |
| $500,000 - 1,999,999 | 25 | 433 | 25.9 | 23.2 | 1,036 | 928 | 108 |
| $100,000 - 499,000 | 77 | 328 | 18.2 | 15.8 | 236 | 205 | 32 |
| Total | 112 | 1,448 | $113.7 | $102.3 | | | |
| **Other Carriers** | | | | | | | |
| Over $2,000,000 | 61 | 5,122 | $521.7 | $489.7 | $8,552 | $8,028 | $ 525 |
| $500,000 - 1,999,999 | 90 | 1,317 | 99.9 | 95.0 | 1,110 | 1,056 | 54 |
| $100,000 - 499,000 | 217 | 1,025 | 64.5 | 58.3 | 297 | 269 | 29 |
| Total | 368 | $7,464 | $686.1 | $643.0 | | | |

Definition of "Bulk Liquid": liquid petroleum products and refrigerated liquid products.
Definition of "Other": agricultural products, dry bulk, mine ores and liquid industrial waste.

Source: Statistics Canada, unpublished data obtained from Transport Division.

As for the category of "other" carriers, the majority of carriers (some 217 of a total of 368) are in the lowest revenue and equity capital grouping. On average, the firms in the "other" carrier class have lower operating incomes and much lower capitalization than those firms included in bulk liquid carriers category. "Other" Class 3 carriers have an average operating income of only $29,000 per firm, and possess only $34,000 per firm in equity; the same relationships between the two carrier categories exist with respect to Class 1 and 2. In sum, the bulk liquid carriers are somewhat more prosperous in terms of operating income and capitalization than their counterparts in the "other" carrier category.

Using the same revenue classes, Table 3 sets out an analysis of the expenses for both bulk liquid and "other" carriers. Each major expense category is measured as a percentage of total expenses incurred. Thus, in the case of bulk liquid carriers, for the Class 1 (i.e., revenues over $2 million) transport expenses (e.g., trucks, fuel, driver wages) accounted for only 61 percent of total costs, the lowest percentage cost of all three classes. This suggests that the largest carriers may be able to achieve certain economies of scale with respect to transport expenses and this might give them a certain competitive advantage over the small carriers. Class 1 carriers have the highest maintenance expense and terminal expenses, 17 percent and 5 percent, respectively, but have the lowest overhead expenses, only 17 percent. The higher expenses might reflect the fact that many of the larger carriers own and operate their own maintenance and terminal facilities. It should be noted that the differences in the composition of operating expenses could be caused by a variety of factors and so one cannot draw firm conclusions on these matters.

With regard to the "other" carrier category, the largest revenue group, Class 1, has higher direct transport costs compared to the smallest revenue carriers (Class 3) and have comparable maintenance expenses. The advantages that the Class 1 carriers have reside in lower administrative costs per unit of expenditure. Thus, in the case of "other" carriers there may not be a clear advantage to the larger operations.

## 3.2 THE LIQUID INDUSTRIAL WASTE TRANSPORTATION SECTOR IN ONTARIO: RESULTS OF A STATISTICS CANADA SURVEY

A.R.A. Consultants requested a special tabulation by Statistics Canada on liquid industrial waste carriers in Ontario for 1985, the latest year data was available at the time of preparing this report. The data was compiled from the Motor Carrier Freight (MCF) survey carried out in 1986. From its sample of all motor carriers in the province, Statistics Canada compiled data for 10 carriers which A.R.A. had identified as "subject waste" and liquid waste carriers from:

- the Ministry of Environment's listing of the top 100 carriers of subject waste, in terms of tonnages carried; and
- OTA's listing of members of its liquid waste carriers subcommittee.

These ten firms accounted for 30% of all manifested wastes in Ontario, and more than 20,000 waste shipments.

Because A.R.A. supplied Statistics Canada with a list of 47 firms it was surprising that only these ten were covered by the MCF survey. The other 37 had revenues which were lower than StatsCan's lowest reporting category (for for-hire carriers), or had fewer than 15 vehicles (for private carriers)*. This seems to indicate that the majority of Ontario's registered waste carriers are quite small in comparison to the trucking industry in general. The vast majority of the 400 certified carriers in Ontario are either very small or involved in subject waste haulage as a sideline to their other activities.

The carriers in this sample indicated that they hauled a broad range of commodities in addition to subject or liquid waste. Seven hauled oil or petroleum products/wastes in addition to liquid wastes, aggregate or road salts. Two others operated dump trucks for the transport of solids, and a third hauled solid and other, unspecified wastes.

*These terms are defined in the glossary.

TABLE 3

DISTRIBUTION OF EXPENSES FOR BULK LIQUID AND OTHER CARRIERS IN ONTARIO, 1985

| Revenue Class | Total Expenses ($mill.) | Distribution of Expenses As A Percentage of Total Expenses: Transport Expenses (%) | Maintenance Expenses (%) | Terminal Expense (%) | Administration & General Expenses (%) | Total Expenses (%) |
|---|---|---|---|---|---|---|
| **Bulk Carriers** | | | | | | |
| Over $2,000,000 | $63.3 | 61% | 17% | 5% | 17% | 100% |
| $500,000 - $1,999,999 | 23.2 | 66 | 12 | 1 | 21 | 100 |
| $100,000 - $499,000 | 15.8 | 63 | 9 | 1 | 27 | 100 |
| **Other Carriers** | | | | | | |
| Over $2,000,000 | 489.7 | 67 | 10 | 5 | 18 | 100 |
| $500,000 - $1,999,999 | 95.0 | 67 | 12 | 1 | 20 | 100 |
| $100,000 - $499,000 | 58.3 | 64 | 10 | 1 | 25 | 100 |

Source: See Table 1.

In terms of the area of operations, all ten of the carriers in this sample operate in Ontario and Quebec; five carriers also transport into the United States. With regard to revenue sources:

- o approximately 90% of revenues are derived from routes in excess of 25 km for for-hire carriers; the private carriers in the sample showed higher revenues from local (less than 25 km) routes;
- o 90% of for-hire carrier revenues are earned from transport within Ontario's borders; and
- o only one company earned as much as 15% of its revenue from U.S. routes, the other carriers had insignificant earnings from the United States.

### 3.2.1 Financial Performance Data

The Statistics Canada sample provided useful information on the financial aspects of the industrial waste carriers in the province; this data is presented in Tables 4 through 7.

Table 4 presents balance sheet information on the 5 for-hire carriers in the sample; no data was collected by Statistics Canada for the private carriers. For-hire carriers collectively employ $11.6 million in assets and have an equity base of $2.4 million. The average firm has total fixed assets (fully depreciated) of $1.4 million, and shareholders equity of less than a half-million dollars. Table 5 confirms that 86% of revenues are earned in long distance haulage (more than 25 kilometres) 12.2% in local transport (less 25 kilometres) 12.2% in local transport (less than 25 kilometres).

Table 6 presents analysis of operating expenses in the industry for both for-hire carriers and private carriers. In the case of for-hire carriers, the single most important expense is the purchase of transportation equipment (including rental equipment), comprising some 37.5% of all costs, the next largest expenses in descending order are those for salaries (15%), fuel (13.1%) and then maintenance costs (12.3%). The comparison with private carriers cannot be readily made since several important expense categories are lumped together.

## TABLE 4

## BALANCE SHEET FOR SAMPLE OF LIQUID INDUSTRIAL WASTE CARRIERS IN ONTARIO, 1985

| | Total Sample ($000) | Average Per Firm ($000) |
|---|---|---|
| | Sample Size = 5 | |
| **Assets** | | |
| Current Assets | $ 4,616 | $ 923.2 |
| Fixed Assets | | |
| Land | 61 | 12.2 |
| Building | 478 | 95.6 |
| Revenue Equipment | 11,852 | 2,370.4 |
| Other Equipment | 143 | 28.6 |
| Shop | 181 | 36.2 |
| Furniture | 44 | 8.8 |
| | 69 | 13.8 |
| Total | 12,828 | 2,565.6 |
| Less Depreciation | 5,854 | 1,170.8 |
| Total Fixed Assets | 6,974 | 1,394.8 |
| TOTAL ASSETS | $11,590 | $2,318.0 |
| TOTAL LIABILITIES | $ 9,175 | $1,835.0 |
| TOTAL EQUITY | $ 2,415 | $ 483.0 |

3.8

Source: Statistics Canada Transportation Division, Motor Carrier Freight Survey (1985) (unplublished).

## TABLE 5

## ANALYSIS OF REVENUE SOURCES FOR SAMPLE OF LIQUID INDUSTRIAL WASTE CARRIERS IN ONTARIO, 1985

| | For-Hire Carriers ($000) | (%) |
|---|---|---|
| | Sample Size = 5 | |
| **Revenue Source** | | |
| Local | $ 3,337 | 12.3 |
| Long Distance | 23,582 | 86.6 |
| Storage | 0 | 0 |
| Equipment Rental | 306 | 1.1 |
| Total Operating Revenue | $27,225 | 100.0 |

Source: Statistics Canada Transportation Division, Motor Carrier Freight Survey (1985) (unpublished).

## TABLE 6

## ANALYSIS OF OPERATING EXPENSES FOR SAMPLE OF LIQUID INDUSTRIAL WASTE CARRIERS IN ONTARIO, 1985

| | For-Hire Carriers ($000) | For-Hire Carriers (%) | Private Carriers ($000) | Private Carriers (%) |
|---|---|---|---|---|
| | | (Sample Size = 5) | | |
| Salaries | $ 3,869 | 15.0% | $ 5,577 | 32.4% |
| Fuel | 3,379 | 13.1 | 2,492 | 14.5 |
| Tires | 711 | 2.8 | * | * |
| Purchased Transport Equipment | 9,690 | 37.5 | * | * |
| Other Equipment | 59 | 0.2 | * | * |
| Vehicle | 367 | 1.4 | 795 | 4.6 |
| Depreciation | 1,290 | 5.0 | 2,901 | 16.8 |
| Subtotal | 19,365 | 75.0 | n.a. | n.a. |
| Maintenance | 3,172 | 12.3 | 2,871 | 16.7 |
| Terminal Costs | 272 | 1.1 | n.a. | * |
| Traffic and Sales | 314 | 1.2 | n.a. | * |
| Insurance | 415 | 1.6 | ** | * |
| Administration | 2,283 | 8.8 | n.a. | n.a. |
| Total Operating Costs | $25,821 | 100.0% | $17,232 | 100.0% |

*Included in maintenance costs.
**Included in vehicle license costs.

Source: Statistics Canada Transportation Division, Motor Carrier Freight Survey (1985) (unpublished).

## TABLE 7

## NET OPERATING REVENUES, PROFITS AND TAXES FOR SAMPLE LIQUID INDUSTRIAL WASTE CARRIERS IN ONTARIO, 1985

| | For-Hire Carriers ($000) | Average Per Firm ($000) |
|---|---|---|
| | Total Sample = 5 | |
| Net Operating Income From Motor Carrier Freight | $1,439.0 | $287.6 |
| Profit | 1,090.0 | 218.0 |
| as a Percentage of Total Assets | 9.4 | |
| Corporate Income Tax | 295.0 | 59.0 |
| Retained Earnings | 795.0 | 159.0 |

Source: Statistics Canada Transportation Division, Motor Carrier Freight Survey (1985) (unpublished).

Finally, Table 7 presents profit and tax data. The most significant observation concerns the fact that before-tax profits as a percentage of total assets averaged 9.4% for the sample during 1985.

### 3.2.2 Comparative Analysis

In order to provide some perspective on the financial performance of the liquid industrial waste haulers, in Table 8 we compare some key financial ratios among the basic segments of the transportation industry. The "transportation sector" data includes all forms of transportation, air, rail, road and water, and is presented for the purposes of providing some type of benchmark for comparison purposes. A more specific benchmark is the performance of large trucking corporations, such as Laidlaw Transportation and Trimac, both of whom haul subject wastes among many other commodities.

According to the data in Table 8, Panel A, the transportation sector as a whole in 1986 had a return on capital of 10.7%, whereas Laidlaw greatly exceeded that performance (20.2%) and Trimac fell short (7.8%). The firms in our small sample of industrial waste carriers fared relatively well, recording a return on capital of 9.4% for 1985, the latest year data is available. As for operating margins, the sample firms registered margins of 5.2%, somewhat below the overall transportation sector average (8.0%).

Turning to Panel B, we provide a measure of the degree of capitalization in the liquid waste transport industry. The measure we employ is equity/total assets. (Because our sample data does not contain data on long- and short-term debt, we are unable to calculate a debt/equity measure.) The equity/total assets ratio reveals the extent to which a company is capitalized by its own resources. As Panel B indicates, the larger industry segment, that is, all bulk liquid carriers, have an equity/total assets ratio of 0.506 and "other carriers" have a ratio of 0.275. By comparison, the carriers in our sample have a ratio of 0.208.

A higher ratio of equity to total assets suggests a stronger borrowing capacity and, therefore, a greater capacity to finance additional capital

expenditures. The firms in our sample, have the lowest ratios and may be constrained from adding further debt to meet new capital expenditure requirements. It must be emphasized, too, that the sample of firms for which we have financial data represents the large firm segment of subject/liquid waste carriers. We can expect the small operators to face similar or more severe debt loads because of the significant capital requirements of operating as a carrier. This suggests that some segments of the industry might find it difficult to raise the capital required to meet higher environmental and safety standards. Discussions with industry officials supported these conclusions.*

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*Views expressed by Mr. Lorne Alter, Executive Director, Ontario Trucking Association.

**TABLE 8**
**COMPARISON OF FINANCIAL RATIOS FOR**
**TRUCKING INDUSTRY AND LIQUID INDUSTRIAL WASTE CARRIERS**

PANEL A
RETURN ON CAPITAL AND OPERATING MARGINS

| | Return on Capital | Operating Margin (%) |
|---|---|---|
| Transportation Sector | 10.65% | 7.98% |
| Public Trucking Corporations (1986): | | |
| Laidlaw Transportation | 20.18 | 14.8 |
| Trimac | 7.81 | 5.0 |
| A.R.A. Study Sample (1985) | 9.4 | 5.16 |

Definitions:

Return on Capital: Net Income before interest and income taxes divided by total debt and total shareholders' equity.

Operating Margin: Operating profit (operating revenue less operating expenses divided by total operating revenues.)

PANEL B
DEGREE OF CAPITALIZATION

| | Ratio of Equity to Total Assets |
|---|---|
| Bulk Liquid Carriers | |
| Revenue Class: | |
| Over $2,000,000 | 0.523 |
| $500,000 - $1,999,999 | 0.493 |
| $100,000 - $499,999 | 0.475 |
| Total | 0.506 |
| Other Carriers | |
| Over $2,000,000 | 0.265 |
| $500,000 - $1,999,999 | 0.305 |
| $100,000 - $499,000 | 0.288 |
| Total | 0.275 |
| A.R.A. Study Sample | 0.208 |

Sources: For transportation sector, see "Report on Business Magazine" July, 1987, Globe and Mail (Toronto)
For A.R.A. study sample, see Tables 4, 5, 6 and 7.
For Bulk Liquid Carriers and other carriers, see Table 2

## 4. INDUSTRIAL STRUCTURE: OPERATIONAL AND REGIONAL CHARACTERISTICS

In this section we examine the structure of the industry which hauls subject waste from several related perspectives:

- o volumes and regional configuration;
- o diversification vs. specialization;
- o fleet characteristics and;
- o operational characteristics.

### 4.1 SUBJECT WASTE TONNAGE BY REGION

Table 9 illustrates the regional characteristics of registered carriers of manifested or "subject" waste". Using Ministry of the Environment data, the 100 largest firms (by tonnage) accounted for 897,141 tonnes in 1986--or some 97% of all subject waste shipped in the province that year. These 100 firms were grouped according to the Ministry of Environment region in which they are registered (Map 1 Because there are few carriers in either the Ministry's Northeastern or Northwestern Regions, we have combined both as the "Northern" Region for the purposes of this analysis). Subsequent analysis assumed that their operations were predominantly within the region in which they are "domiciled" (registered). This is a bold assumption because many carriers operate between regions or make shipments from across the province to specialized receivers and reclamation facilities (such as Breslube's Breslau operation) or disposal sites (such as Tricil's incinerator at Sarnia). Nevertheless, the head office location is in most instances a good indicator of the center of a carrier's operation, and of its regional concentration of operations. It is also a good indicator of the regional structure of industries which produce subject wastes. (In any event, head office location is the only indicator readily available from Ministry records which facilitates this level of analysis.)

Indeed, most subject wastes not destined for specialized use or disposal are transported the minimum distance possible--i.e., to the closest certified landfill, water pollution control plant or other treatment facility or end use. Based on the destinations of manifested subject wastes indicated

**TABLE 9**

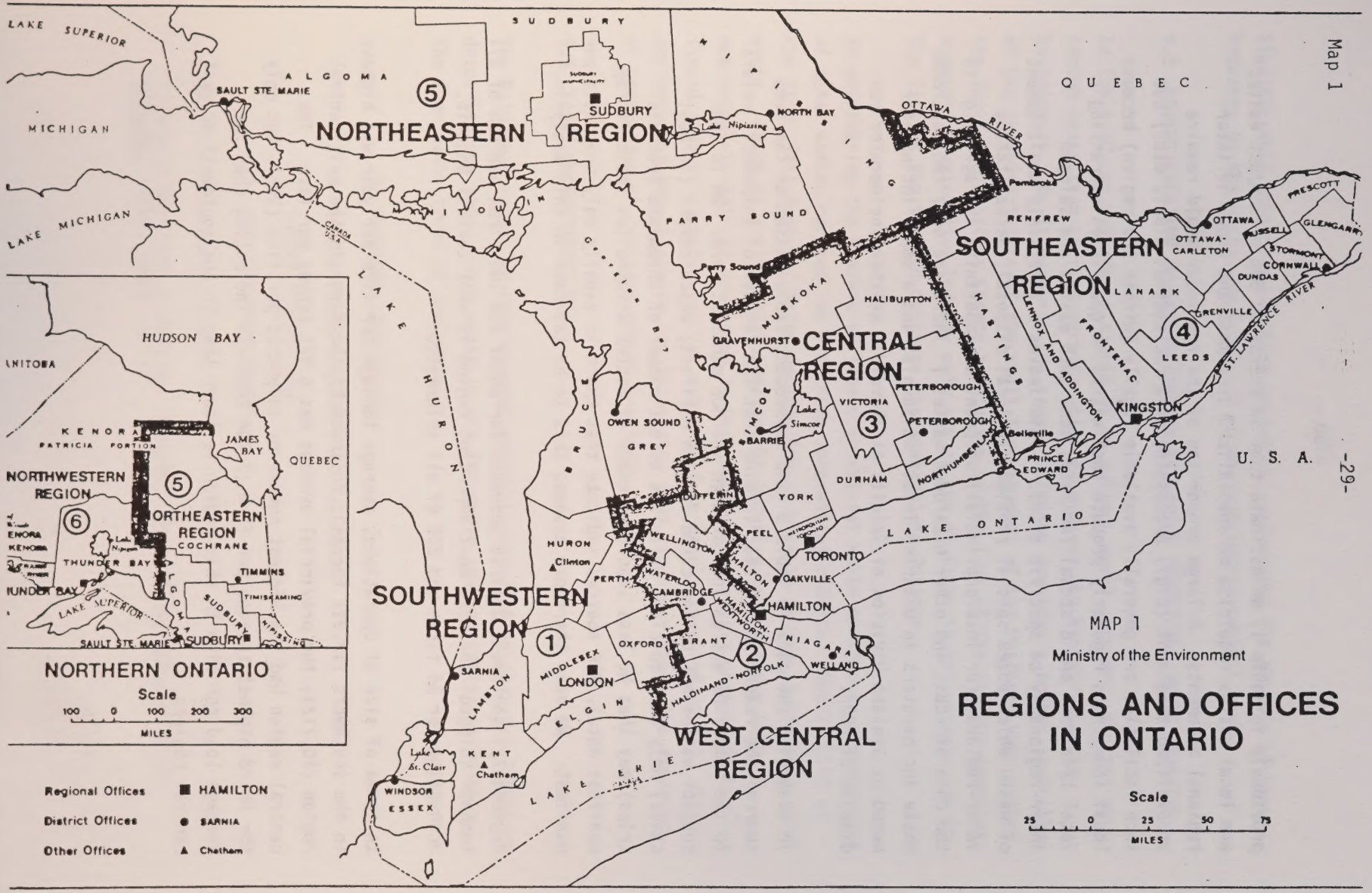
**CHARACTERISTICS OF THE 100 LARGEST (BY TONNAGE) LIQUID & HAZARDOUS INDUSTRIAL WASTES CARRIERS IN ONTARIO, BY M.O.E. REGION, ONTARIO, 1986**

| | MOE REGION IN WHICH FIRM IS REGISTERED: | | | | | |
|---|---|---|---|---|---|---|
| | Southwest | West Central | Central | Southeast | Northern* | Total Ontario |
| Number of Firms | 28 | 24 | 28 | 15 | 5 | 100 |
| Total Subject Waste Transported (tonnes) | 361,498 | 257,093 | 215,722 | 55,229 | 7,599 | 897,141 |
| Total Number of Shipments | 22,376 | 19,300 | 25,200 | 3,473 | 450 | 70,799 |
| **Averages:** | | | | | | Average: |
| - Tonnes/Firm/Year | 12,911 | 10,712 | 7,704 | 3,682 | 1,520 | 8,971 |
| - Tonnes/Shipment | 16 | 13 | 9 | 16 | 17 | 13 |
| - Shipments/Firm | 799 | 804 | 900 | 232 | 90 | 708 |

*Because there are few large liquid waste carriers in either of MOE's Northeastern and Northwestern Regions, we have for the purposes of this report combined the two regions as "Northern".

"Number of shipments" refers to the number of wastes indicated on the MOE manifest. See accompanying text.

Source: Manifest data from Ontario Ministry of Environment.


LAKE SUPERIOR
MICHIGAN
LAKE MICHIGAN
ALGOMA
SAULT STE. MARIE
SUDBURY
NORTHEASTERN REGION
NORTH BAY
Lake Nipissing
OTTAWA RIVER
QUEBEC
Pembroke
RENFREW
PARRY SOUND
MANITOULIN
GEORGIAN BAY
Parry Sound
MUSKOKA
HALIBURTON
GRAVENHURST
CENTRAL REGION
SOUTHEASTERN REGION
OTTAWA
OTTAWA-CARLETON
PRESCOTT
RUSSELL
GLENGARRY
STORMONT
CORNWALL
DUNDAS
LANARK
GRENVILLE
LEEDS
ST. LAWRENCE RIVER
LENNOX AND ADDINGTON
FRONTENAC
HASTINGS
PETERBOROUGH
KINGSTON
Belleville
PRINCE EDWARD
NORTHUMBERLAND
DURHAM
VICTORIA
PETERBOROUGH
OWEN SOUND
GREY
BARRIE
Lake Simcoe
SIMCOE
DUFFERIN
YORK
PEEL
METROPOLITAN TORONTO
TORONTO
LAKE ONTARIO
HURON
Clinton
WELLINGTON
PERTH
WATERLOO
CAMBRIDGE
HALTON
OAKVILLE
HAMILTON
HAMILTON-WENTWORTH
NIAGARA
WELLAND
SOUTHWESTERN REGION
OXFORD
BRANT
HALDIMAND-NORFOLK
SARNIA
LAMBTON
MIDDLESEX
LONDON
ELGIN
KENT
Chatham
Lake St. Clair
WINDSOR
ESSEX
LAKE ERIE
WEST CENTRAL REGION
U. S. A.
HUDSON BAY
MANITOBA
KENORA
PATRICIA PORTION
JAMES BAY
QUEBEC
NORTHWESTERN REGION
NORTHEASTERN REGION
COCHRANE
THUNDER BAY
TIMMINS
TIMISKAMING
SUDBURY
NIPISSING
ALGOMA
SAULT STE. MARIE
NORTHERN ONTARIO
Scale
100 0 100 200 300
MILES
Regional Offices ■ HAMILTON
District Offices ● SARNIA
Other Offices ▲ Chatham
MAP 1
Ministry of the Environment
REGIONS AND OFFICES IN ONTARIO
Scale
25 0 25 50 75
MILES

previously in Table 1, we estimate that in excess of 60% of subject wastes are local wastes requiring no specialized treatment and hence no inter-regional movements. A large proportion of the remainder would require specialized treatment (e.g., processing at a reclamation plant, etc.) but such facilities are generally available locally (within the region) because local industries regularly produce such wastes in quantities warranting a local treatment and disposal facility; some such wastes are shipped inter-regionally to specific sites. This leaves a relatively small amount of waste which poses special problems in local disposal, necessitating inter-regional (or interprovincial) shipment or indefinite storage (e.g. in the case of PCBs, and other hazardous wastes.) There are only two hazardous waste incinerators in Ontario--Tricil at Sarnia, and a small incinerator owned by Syntath Division of Tricil, at Thorold. Neither incinerator can dispose of PCBs.

In examining the data in Table 9 (and subsequent tables based on the same source) the reader should bear in mind that the "number of shipments" refers to the number of wastes indicated on the MOE manifest form. Up to four subject wastes may be indicated on each manifest, which covers (in most cases) only one vehicle. While the actual number of shipments (vehicle trips) may thus be less than the number of wastes shipped (as indicated by manifest data), MOE sources indicate that there is usually only one waste per manifest. We have therefore assumed this to be the case in this analysis.

Regionally, southwest Ontario accounts for 28 of the 100 firms and 40% of all tonnage shipped; the next most important region is west central Ontario, accounting for 24 firms and 29% of all shipments.

In terms of size of operations, average tonnage per firm per year was highest in the southwest (12,911 tonnes), followed by the firms in the west central region (10,712); the provincial average was 8,971 tonnes per firm. The central region had the highest number of shipments per firm (900), but only the third highest tonnage per firm (7,704 tonnes), indicating that the average load per firm in this region is lower than in the southwest or west central regions.

Significantly, the five northern operators, reflecting the absence of heavy industry in the north, haul only 1% of the province's subject waste.

## 4.2 DIVERSIFICATION OR SPECIALIZATION BY LIQUID INDUSTRIAL WASTE CARRIERS

In Table 10, we consider a sample of 44 subject waste carriers selected on a random basis from carrier certification records at the Ministry of the Environment. As it happens, the sample selected provides a better indication of the characteristics of the small firm segment of the business than either the special Statistics Canada tabulation or the list of the top 100 carriers examined previously. Indeed, only six of the 44 firms in this sample are on the list of the top 100 carriers (by tonnage) in Ontario.

In considering the measure of liquid industrial waste carried as a percentage of total wastes carried, we find some interesting results. Nearly half of the firms (21) reported being engaged 50% or more in moving liquid industrial waste. There is a clear dichotomy in the industry in the sense that approximately half of the firms in this sample are heavily engaged in hauling liquid industrial waste and the other half is hardly involved at all. This corroborates the Pilorusso and Associates 1983 findings* about the diversity of operations of "special waste" carriers.

## 4.3 FLEET CHARACTERISTICS

The Pilorusso report on the "special waste" transportation industry (1983) describes the basic fleet units in use for waste transportation in Ontario. The four basic types of equipment are:

- straight tank trucks
- tractor/tank trailer combinations;
- lugger trucks; and
- straight dump trucks.

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* Pilorusso Research Associates, Transportation of Special Wastes in Ontario, (OWMC, 1983), p. 57

**TABLE 10**

**CHARACTERISTICS OF A SAMPLE OF REGISTERED CARRIERS BY REGION**

| | MOE REGION IN WHICH FIRM IS REGISTERED: | | | | | |
|---|---|---|---|---|---|---|
| | Southwest | West Central | Central | Southeast | Northern* | Total |
| Sample | 10 | 8 | 9 | 7 | 10 | 44 |
| Location | Local - 7<br>USA - 3 | Local - 7<br>USA - 1 | Local 9 | Local 6<br>Quebec 1 | Local 9<br>USA 1 | Local - 38<br>USA - 5<br>Quebec - 1 |
| **Liquid Industrial Waste as % of Total Waste Carried** | | | | | | |
| # of Firms With | | | | | | |
| 0 - 10% | 5 | 2 | 5 | 3 | 1 | 16 |
| 11 - 49% | 1 | 1 | 1 | 0 | 4 | 7 |
| 50 - 89% | 2 | 1 | 0 | 1 | 2 | 6 |
| 90 -100% | 2 | 4 | 3 | 3 | 3 | 15 |
| **Frequency of Collection, Industrial Wastes:** | | | | | | |
| Daily | 4 | 3 | 2 | 2 | 1 | 12 |
| Weekly | 2 | 1 | 1 | 0 | 0 | 4 |
| On Call/As Required | 3 | 1 | 5 | 3 | 4 | 16 |
| Other (Specify) | - | 1<br>(Emerg.) | 1<br>(no ind.) | 1<br>(no ind.) | 1<br>(spill clean up) | 4 |

Source: Carrier Registration files, Ministry of the Environment

*Because there are few large liquid waste carriers in either of MOE's Northeastern and Northwestern Regions, we have for the purposes of this report combined the two regions as "Northern".

The latter two types of equipment are used for the transport of solid wastes or for partially dewatered liquid wastes. Pilorusso surveyed forty Ontario carriers as to fleet composition, and found their fleets composed largely of tank units "as they were primarily engaged in the transportation of liquid industrial wastes." (p. 71) The study also found that less than 1% of waste shipments were made in drums. Drums are problematic to handle in comparison to pumped waste, and are often used only for the most problematic wastes and for very small shipments.

Table 11 describes Pilorusso's major findings concerning fleet compositions, capacities, etc. The reader is referred to Section 5.4, pages 68-76, of the Pilorusso report, which provides a detailed discussion of factors behind the predominance of certain types of equipment/practices.

For the current study, A.R.A. received information on the fleet structure of the sample of 10 for-hire and private carriers (Table 12) for which Statistics Canada made a special tabulation (see Section 3.2 above). These firms are all large transportation operators in comparison to the majority of registered carriers in Ontario.

Interestingly, these firms overwhelmingly own their fleet units, instead of leasing them. The Ontario Trucking Association confirmed that liquid waste transportation and handling equipment is particularly specialized, so that leased equipment is not readily available on the market. This equipment must often be "dedicated" for particular types of liquid waste alone.

From Table 12, it is obvious that these large firms transport a considerable quantity of non-liquid commodities in addition to liquids. This is true for smaller firms as well; firms in the sample of 44 randomly selected carriers (referred to in Section 4.2--selected from MOE carrier certification records) carry a wide variety of commodities. Most are small operators; most

TABLE 11

SUMMARY OF
TRANSPORTATION EQUIPMENT
USED BY CARRIERS SURVEYED
BY PILORUSSO RESEARCH ASSOCIATES (1983)*

| TYPE OF UNIT | NUMBER | NOTES |
|---|---|---|
| **Bulk Liquid:** | | |
| Straight Tank Trucks | 126 (all carbon steel tanks) | - capacity 3,600 - 18,900 l. (400-4,200 gal.)<br>- 78% between 10,800 and 15,000 l.<br>- largest and smallest tanks are dedicated.<br>- all equipped with vacuum equipment.<br>- 3 vehicles have lined tanks. |
| Tank Trailer | Total: 121<br>Comprised of:<br>- 62 carbon steel<br>- 44 stainless steel<br>- 15 aluminum | - capacity 9,000 - 45,000 l (2,000 - 9,000 gal.)<br>- 62% smaller than 25,000 l.<br>- 23% equipped with independent vacuum system. (These without either have a vacuum system in the tractor, or use the generator's.)<br>- 17 carbon steel tanks, and 2 stainless steel tanks, are lined; 2 stainless steel tanks are insulated. |
| **Other Vehicles:** | | |
| Lugger trucks | 8 | |
| Lugger trailers | 3 | |
| Dump trucks | 4 | |
| **Other Non Bulk Liquid Equipment and Vehicles:** | | |
| Straight trucks: | | |
| Vans | 4 | |
| Stakes | 4 | |
| Trailers: | | |
| Vans | 21 | |
| Flatbeds | 8 | |
| Tractors | 76 | |

*The Pilorusso study surveyed 40 liquid waste carriers, identified from MOE waybills. These carriers accounted for 83.3% of liquid industrial waste moved on MOE waybills in Ontario in 1982.

Source: After Pilorusso (1983), pp. 68-75.

**TABLE 12**

**FLEET CHARACTERISTICS OF TEN SAMPLED FOR HIRE AND PRIVATE CARRIERS IN ONTARIO (1986)**

| Vehicles: | For Hire Carriers | | | Private Carriers | | |
|---|---|---|---|---|---|---|
| | Total | Owned | Leased | Total | Owned | Leased |
| Total Straight Trucks | 18 | 18 | 0 | 148 | 148 | 0 |
| Total Straight Trucks with Liquid Tanks | 11 | 11 | 0 | NA | NA | NA |
| Total Road Tractors | 159 | 143 | 16 | 248 | 248 | 0 |
| Trailers: | | | | | | |
| Total Full Trailers | 14 | 14 | 0 | 92 | 92 | 0 |
| Total Semi-Trailers | 254 | 202 | 52 | | | |
| Total Semi-Trailers With Liquid Tanks | 81 | 78 | 3 | NA | NA | NA |
| - Trailers < 10 meters | 44 | 42 | 2 | NA | NA | NA |
| - trailers > 10 meters | 37 | 36 | 1 | NA | NA | NA |

Note: Financial characteristics of these same ten firms are examined in Section 3.2 of this report.

Source: Special compilation of Motor Carrier Freight (MCF) and private truck use surveys by Statistics Canada, Transport Division.

## TABLE 13

## SHIPMENT CHARACTERISTICS OF A SAMPLE OF SMALL PRIVATE CARRIERS IN ONTARIO WITH OWNED FLEETS OF LESS THAN 15 UNITS

| Carrier | Fleet Units | Total Tonnes Carried, 1986 | Number of Shipments 1986 | Tonnes/ Shipment | Tonnes/ Truck | Shipments/ Truck |
|---|---|---|---|---|---|---|
| 1 | 8 | 83,504 | 2,693 | 31 | 10,438 | 337 |
| 2 | 10 | 24,819 | 1,355 | 18 | 2,482 | 136 |
| 3 | 8 | 17,649 | 490 | 36 | 2,206 | 61 |
| 4 | 10 | 15,497 | 2,706 | 6 | 1,550 | 271 |
| 5 | 12 | 12,476 | 584 | 21 | 1,040 | 49 |
| 6 | 5 | 10,934 | 1,229 | 9 | 2,186 | 246 |
| 7 | 7 | 8,238 | 372 | 22 | 1,177 | 53 |
| 8 | 4 | 5,059 | 596 | 8 | 1,265 | 149 |
| 9 | 3 | 1,816 | 357 | 5 | 605 | 119 |
| 10 | 4 | 51 | 24 | 2 | 5 | 6 |
| 11 | 5 | 1,433 | 232 | 6 | 287 | 46 |
| 12 | 10 | 77 | 37 | 2 | 8 | 4 |
| TOTAL FOR ALL CASES | 86 | 181,553 | 10,675 | 17 | 2,119 | 124 |

Source: Special tabulation of private carrier data, for private carriers with fewer than 15 fleet units, and Ministry of Environment manifest data.

have capabilities for transporting liquid waste, but do not exclusively haul subject waste. Many have solid and liquid transport capabilities. (Appendix 3.)

## 4.4 LOAD/SHIPMENT CHARACTERISTICS

Statistics Canada provided data on fleet sizes for a sample of 12 private carriers with owned fleets of less than fifteen units. This data was supplemented by data from MOE's manifest records. The results are shown in Table 13, which provides an indication of shipment weights, and shipments/fleet unit/year. It is clear from the shipments per truck column that some of these carriers are occupied with hauling subject waste on a regular basis, while others have relatively few subject waste shipments per truck. Such operators must be engaged in hauling other commodities--either non-subject wastes, or non-waste materials: the economics of the business are such that revenue generating units must be active in some capacity rather than sitting idle. This conclusion is corroborated by the data in Table 10, which indicated that many registered liquid industrial waste carriers hauled only small quantities of liquid waste--i.e., as a sideline to their other activities. Integration of liquid waste transport activity with other activities is therefore very common amongst carriers.

## 4.5 TECHNOLOGICAL INNOVATION

The transportation of liquid industrial waste is undergoing some technological change in terms of the type of equipment used, and the operation of transfer stations to bulk or treat wastes. One of the most interesting technological developments is the introduction of fibreglass tanks, which can haul a wider variety of wastes than either mild carbon steel or stainless steel tanks. Fibreglass is not corroded by wastes which would corrode even stainless steel.

In discussions with industry experts, three main forces were cited as pushing carriers to introduce new technology. They are:

- The economic opportunities for specific liquid industrial waste products are constantly shifting. A waste product once considered to have no economic value can, in a relatively short time, become a useful commodity with a market value which results in a new segment of the industry. One such example is "pickle liquor" (a waste product in steel making) which steel makers formerly paid to dispose of. Recently, an economic use has been found for this waste and a new segment of the waste haulage industry has emerged, requiring specialized carrying and handling/treatment techniques.

- As federal and provincial authorities pass legislation upgrading safety requirements, the industry is constantly looking for new and better equipment to meet these standards without adding to the cost of operations. Cost containment is a driving force in developing new technology to meet these standards.

- With the introduction of legislation, such as the "Spills Bill" which places a heavy financial burden on the carrier for environmental clean-up, the industry is naturally looking to new technology to minimize the risks in transporting waste products.

The Pilorusso study cites the following equipment innovations currently underway in the liquid transportation industry*:

- smaller average size of a load from a generator due to better management of waste products.

- smaller shipment sizes lead to compartmentalized tanks which can carry different waste types in one trip; in effect, increasing the density levels of the waste.

- a trend towards the use of more tank trailers than straight tank trucks.

*p. 75

# 5. MARKET CONCENTRATION AND MARKET SEGMENTS

This section describes market concentration in the subject waste transportation business, and describes some of the market segments in the industry. The discussion is based on analysis of the top 100 (by tonnage) firms in Ontario, which were discussed previously in Section 4.1.

## 5.1 CONCENTRATION BY SIZE

In Table 14 we set out market share and concentration data on a regional basis. To begin with, the largest three carriers of subject waste in each region account for a disproportionately large share of tonnage and total shipments. For example, in the southwest region, the largest three carriers account for only 11% of all firms but move 51% of total tonnage and account for 46% of total shipments. For the province as a whole, the three largest carriers accounted for 29% of all tonnage and 17% of all shipments. While carriers may do business in more than one region, no carrier is among the three largest in more that one region.

## 5.2 OUT-OF-PROVINCE CARRIERS

Out-of-province firms account for 14% of the province's largest carriers (Table 14). By and large, these firms account for a smaller proportion of total waste shipped in the province than their numbers would suggest. They are generally specialized carriers hauling wastes for specialized treatment in Ontario (e.g. Michigan wastes for incineration at Tricil, or chlorinated wastes for incineration by St. Lawrence Cement in Mississauga) or for reclamation/treatment inside or outside of Ontario (e.g. oils to Breslube; solvents; or liquids destined for "stablex" treatment in Quebec. Several of these firms are affiliated (integrated) with downstream treatment or reclamation operations--e.g. Speedy Oil with Breslube, and Lubex with Canadian Oil; Tricil's Quebec operations; and American firms such as Environmental Waste Control, Inland Waters Pollution Control and Great Lakes Environmental, which have downstream facilities in the US.

**TABLE 14**

**MARKET SHARE & CONCENTRATION AMONG THE TOP 100 LIQUID AND HAZARDOUS INDUSTRIAL WASTE CARRIERS IN ONTARIO**

| Concentration in Each Region by Category: | REGION IN WHICH FIRM IS REGISTERED: Southwest | West Central | Central | Southeast | Northern | Ontario: Total |
|---|---|---|---|---|---|---|
| **Largest 3 Carriers:** | | | | | | |
| Firm 1 - Tonnes | 120,740 | 83,504 | 56,573 | 10,102 | 2,644 | 120,740 |
| # Shipments | 7,465 | 2,693 | 2,068 | 875 | 168 | 7,465 |
| Firm 2 - Tonnes | 32,590 | 37,021 | 24,819 | 8,361 | 1,463 | 83,504 |
| # Shipments | 1,286 | 3,280 | 1,355 | 375 | 78 | 2,693 |
| Firm 3 - Tonnes | 31,903 | 27,507 | 22,261 | 8,238 | 1,377 | 56,573 |
| # Shipments | 1,462 | 1,888 | 1,393 | 372 | 51 | 2,068 |
| Top 3 Carriers as % of Region's Total | | | | | | |
| - Firms | 11% | 13% | 11% | 20% | 60% | 3% |
| - Tonnes | 51% | 58% | 48% | 48% | 72% | 29% |
| - # Shipments | 46% | 41% | 19% | 47% | 66% | 17% |
| **Out of Province Carriers:** | | | | | | |
| (origin) # of cases | (USA) 7 | (USA) 2 | 0 | (4 QUE)5 (1 USA) | 0 | 14 |
| - as % of Region's Total Carriers | 25% | 17% | 0 | 33% | 0 | 14% |
| - as % of Region's Wastes Carried | 7% | 5% | - | 25% | - | 6% |
| - as % of Region's Total Shipments | 5% | 5% | - | 21% | - | 4% |
| **Largest Integrated "Generators"/Transporters*:** (see Table 15) | | | | | | |
| # of Cases | 6* | 5 | 3** | 0 | 1 | 15 |
| # of Carriers Included in Integrated Totals | 9 | 6 | 3 | 0 | 1 | 20 |
| - as % of Region's Carriers Included in Integrated Totals | 32% | 25% | 11% | 0 | 20% | 20% |
| - as % of Region's Wastes Carried | 53% | 63% | 8% | - | 18% | 43% |
| - as % of Region's Total Shipments | 72% | 46% | 9% | - | 11% | 39% |
| **Townships:** | | | | | | |
| # of Townships | 0 | 0 | 8 | 6 | 1 | 15 |
| - as % of Region's Total Carriers | 0 | 0 | 32% | 40% | 20% | 15% |
| - as % of Region's Wastes Carried | 0 | 0 | 16% | 31% | 19% | 6% |
| - as % of Region's Total Shipments | 0 | 0 | 9% | 43% | 17% | 5% |

*Includes one "integrated carrier" comprised of three carriers separately registered. The largest is registered in this region, and accounts for 95% of the waste carried by the integrated operation. The other two carriers are registered in West Central and Southeast (originating in Quebec) respectively.

**Includes one firm registered in Southeast region but resident in Quebec, which accounts for more than 1/2 of this integrated carrier's tonnage.

"Northern Region" contains combined data for MOE's Northeastern and Northwestern Regions.

Source: As for Table 9

**TABLE 15**
**LARGE "INTEGRATED" GENERATORS/CARRIERS*, 1986**

| Company | Totals Consolidated for No. of Generators/Carriers** | Subject Waste Generated (Tonnes) | Subject Waste Carried (Tonnes) | # Shipments | Average Size of Shipment (Tonnes) | %, Waste Carried to Waste Generated |
|---|---|---|---|---|---|---|
| Atlas Steels | 1/1 | 2,948 | 2,696 | 77 | 35 | 91 |
| Anachemia Solvents | 1/1 | 3,379 | 6,884 | 480 | 14 | 204 |
| Breslube, Canam Oil etc. | 2/2 (1 Cdn., 1 U.S.) | 59,696 | 37,982 | 3,321 | 11 | 64 |
| Canadian Oil Co./Lubex | 1/2 (1 Ont., 1 Que.) | 3,214 | 5,251 | 545 | 10 | 163 |
| Canflow | 2/1 | 23,361 | 10,096 | 481 | 21 | 43 |
| CPW Disposal/Chem-King | 1/1 | 11,641 | 5,142 | 1,289 | 4 | 44 |
| Dofasco | 2/1 | 31,799 | 27,507 | 1,888 | 15 | 87 |
| Dow Chemical | 1/1 | 13,416 | 5,070 | 595 | 9 | 38 |
| Envir Mgt. Corp. London | 1/2 (1 U.S., 1 Cdn.) | 10,424 | 37,709 | 2,329 | 16 | 362 |
| Frontier Chem Waste (US) | 1/1 (U.S.) | 6,395 | 10,837 | 846 | 13 | 169 |
| Imperial Oil, Esso Petroleum/Chemical | 3/1 | 25,892 | 9,920 | 983 | 10 | 38 |
| Polysar | 1/1 | 25,652 | 1,268 | 184 | 7 | 5 |
| Spruce Falls Power & Paper | 1/1 | 2,993 | 1,377 | 51 | 27 | 46 |
| Tricil | 3/3 (2 Ont., 1 Que.) | 39,822 | 127,601 | 11,502 | 11 | 320 |
| Walker Bros./ Woodington Systems | 1/1 | 77,692 | 83,504 | 2,693 | 31 | 107 |
| **Integrated Cases:** 15 | 22/20 | 338,324 | 372,844 | 27,264 | 14 | 110 |

*Matched from the Ministry of Environment's listing of the top 50 generators of subject wastes, and the top 100 carriers of subject waste, from manifest data for 1986.

This provides an indication of the degree of integration. A more detailed analysis would point out further cases - i.e., by analysis of the listing of the next 50 generators, and so on.

Many firms indicated as "generators" are in fact "receivers", i.e., at transfer stations. These firms operate large disposal/treatment facilities and tranship substantial quantities of waste.

**For example, "1/1" indicates that a company has both a generator registration and a carrier certification. "1/2" indicates that a company has one generator registration, and two subsidiaries, affiliates, or related operations with carrier certificates. "2/1" indicates a company with two separately registered generating facilities, and one certified carrier; etc.

## 5.3 INTEGRATED CARRIERS

Next, Table 14 considers "integrated carriers" (i.e. firms which, on a consolidated basis, both generate and transport subject wastes; see note to Table 15). As Table 14 indicates, these integrated firms possess a disproportionate market share in the southwest and west central regions. They account for 53% and 63% of total waste carried in each respective region. There is no significant market dominance by integrated firms in the other three regions.

Following up on the activities of the integrated operators, we present in Table 15 a list of the largest integrated firms, and their volumes generated and carried in 1986.

In total these 15 integrated firms generated some 338,324 tonnes and carried 372,844 tonnes; in other words, the firms collectively carried 10% more waste than they generated. In some cases, these firms carried quantities of subject waste well in excess of the amounts they "generated", for example Anachemia Solvents (204%), Environmental Management Corp. (362%) and Tricil (320%). Some of the largest integrated firms are more into the "downstream" waste transport, storage and disposal/treatment/reclamation business. They "generate" wastes at their treatment site, or from transfer stations.

Some of the other carriers are clearly integrated with the "upstream" production processes of their companies. These firms are engaged in hauling their own industrial wastes to a disposal/treatment/reclamation site (e.g. Spruce Falls Power and Paper). (Parenthetically, we include here Polysar and Imperial Oil. Both are generators of liquid waste, and have some capacity for waste transport. However, the nature of these integrated operations is not as clear cut as for others. For example, Polysar has until recently accepted waste from other carriers at its own undercapacity treatment facility; many of the firm's own wastes are brokered rather than handled by itself. These two companies are included here only to illustrate the diversity of the integrated firms' operations.)

The cost and operational considerations which generators and receivers weigh when deciding to operate their own fleets require additional attention.

### 5.3.1 Upstream Integration

A number of waste carriers are themselves generators of liquid waste. These generators may integrate downstream into carrier activities for cost reasons, or because there are operational imperatives which make hauling their own wastes necessary--i.e. timeliness of service, or the absence of local carrier capacity. The example provided by three carriers in the top 100 listing who are actually producers in the pulp and paper industry, illustrate a typical generator's transport operations. These three firms are engaged in hauling their own waste from plant to off-site disposal. (One of these firms, Spruce Falls Power and Paper Co., is included as an "integrated" large generator/carrier in Table 15).

This activity may be regular, or it maybe required only when on-site treatment facilities break down. For example, the James River Marathon plant previously hauled lime mud (classified as a liquid waste) generated by the Kraft pulping process to a local landfill, when its on-site kiln was not in operation. A new process at the plant has reduced the liquid content of the lime mud from 60% to 20%; it is now classified as a solid (based on the slump test) and is not a subject waste. When necessary, it is hauled to a local landfill, in cement trucks owned by the company. Company officials indicate that they use their own vehicles because there are simply no local carriers in their region of the north. The nearest ones are in Thunder Bay--four hours away. The company is never able to predict when its kiln will be out of operation to notify a commercial carrier.*

All pulp and paper producers in Ontario have some primary effluent treatment facilities on site. Secondary treatment/disposal facilities may or may not be on site, depending on space availability. This seems to be a greater constraint in southern Ontario than the north, as evidenced by a recent article in Pulp and Paper Canada. ** Effluent quantities and treatment requirements depend on the production process utilized at each plant, and the

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* Lockwood's Directory of the Paper and Allied Trades, 1985; and pers. comm., James River/Marathon officials.

**W.F. Fell and M.T. Reid, "Effluent Treatment Associated with a Modernization Program at Ontario Paper Company", (P & P Canada, 88:5,1987).

primary treatment system. Clarifier systems alone can produce significant quantities of subject liquid waste. The Abitibi/Provincial Papers plant in Georgetown makes 287 shipments/year in contrast with the other plants cited previously.

### 5.3.2 Downstream Integration

The most common form of integration for carriers of liquid industrial waste is downstream--that is, with a treatment, reclamation or disposal facility or capability. There are two types of waste stream; these streams dictate cost and fee structures affecting various wastes. They are:

- wastes which have no other economic use or value;
- wastes which have value because they are reclaimable, reusable, or recyclable.

Various integrated carriers specialize in various kinds of waste. To illustrate these specializations, it is useful to examine the examples of some of the largest integrated carriers, Tricil, Environmental Management Corporation, and Canam Oil/Breslube.

Tricil Limited is by far the largest carrier (by tonnage) of subject waste in Ontario. The main competitive advantage Tricil has over its competitors is the full-service treatment of waste which is provides its customers--that is, from plant to final disposal.

Tricil, which is owned by Trimac Limited and C-I-L Inc., has been in the waste management business for over ten years. It operates a fleet of waste transport trucks and solid waste collection and disposal facilities across North America, two Canadian energy-from-waste plants, and liquid industrial waste collection, treatment, destruction and disposal facilities in Ontario and Quebec. Tricil's service activities are carried out from 22 locations in Canada and the United States. Corporate headquarters are in Mississauga.

The liquid Waste Division operates a truck fleet of 80 vehicles out of LaSalle, Quebec, and Sarnia and Mississauga, Ontario. The Mississauga facilities also house pretreatment and transfer operations.

In Sarnia, Tricil's new liquid-injection, high-temperature incinerator system came on stream in October, 1983. The $9 million system replaces the original organic waste incinerator which had operated on the site since the late sixties. The new plant has an annual capacity of 120 million litres of organic waste and 40 million litres of inorganics. Inorganics (dewatered alkaline wastes) are used to remove acid gases from the incinerator exhaust. A fabric filter traps particulate. All the solid process residues are placed in Tricil's secure chemical landfill...Destruction efficiency exceeds 99.99 percent, with a residue by weight of 5 percent.

In Quebec, Tricil has two operations located southwest of Montreal. Tricil (Quebec) Inc., in LaSalle provides waste transportation, transfer and in-plant industrial maintenance...Les Entreprises d'Incineration Industrielle Goodfellow Inc., in Ville Mercier destroys organic wastes by high-temperature incineration. The liquid-injection incinerator, which Tricil has operated since 1973, can handle approximately 38 million litres of liquid waste a year. Incineration conditions are comparable to those at Tricil's Sarnia facility. Waste mixing and blending is performed on-site to prepare a suitable fuel mix.*

In addition to operating its own fleet, Tricil accepts (for a charge) wastes for disposal from other carriers. Some of these wastes are hauled considerable distances. Some are hauled from local generating sites.

The Environmental Management Corporation (EMC) is an example of a carrier which started in a related business (industrial plant cleaning) and diversified into liquid waste transport, and later into limited downstream (transfer station) operations, as the industry grew.**

EMC currently operates a fleet of liquid waste trucks out of London, in addition to its transfer station facility, to which it transports wastes for bulking or pretreatment. EMC operates as a for-hire carrier, charging for

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* From Chapter X, "Commercial Waste Disposal Services," Hazardous Waste Management Handbook, Fourth Edition (Corpus Information Services, Don Mills, Ontario; c.a. 1986).

**pers. comm., Ted Sorokopas, EMC

disposal; it does not (unlike Breslube--see below) pay generators for wastes which have potential for reuse, recycling or reclamation. The company has no recycling or disposal capacity on site.

In contrast to Tricil and EMC, the Canam Oil/Breslube conglomerate is in the downstream recycling end of integrated operations. The company operates one of the largest oil recycling operations in North America at Breslau, Ontario. Apparently the company integrated upstream into the carrier business from its refinery operations to ensure a dependable supply for the plant. It currently operates a large fleet of trucks which collects oil throughout Ontario, Quebec and the US. Company officials estimate that Breslube handles 80% of Ontario's waste oil, and 40% of Quebec's*. The remainder of Ontario's waste oil is largely handled by Canadian Oil Co. Ltd.

About 60% of the oil handled at Breslube comes from the United States; the company has a U.S. subsidiary, Speedy Oil, with extensive operations in the northeastern states. A company official indicates that there are no particular problems encountered in crossing the international border with waste oil.

Canam/Breslube's operations are closely linked to the price of crude oil. When the crude price was high, the company paid generators in order to collect from their premises. With the oil price low, as at the present time, Breslube charges for collection services.

Breslube occasionally accepts oil from other carriers, but does not promote this practice. It charges such carriers F.O.B. its facility, so there is no margin for other carriers in such activity. The company indicates that, as an integrated carrier, it can collect, transport and treat the oil more efficiently and cheaply than if it involves other middlemen carriers. Scale and integrated operations are definite advantages to the company in this regard.

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* pers. comm., Dale Schofield, Canam Oil/Breslube

In the course of its operations, Breslube and its affiliated companies also transport other kinds of subject waste, on an hourly, for-hire basis. Those transport activities are clearly sidelines to the firm's main integrated oil transport and recycling activities. For known, regular shipments, Breslube may charge a fixed fee/gallon, rather than charging on an hourly basis. This may be more attractive to the customer, who does not then have to pay for unpredictable waiting time, etc. This results in a "blended fee" to the customer incorporating both distance and time factors, for example charges per gallon are determined by the following formula:

[(Distance @ $2 per mile) + (2 hours loading @ hourly rate) + 2 hours unloading @ hourly rate) + (1 hour wait at border @ hourly rate)] / size of load (in gallons) = cost per gallon.

Other carriers prefer an hourly rate to a price per gallon. Environmental Management corporation indicates that the latter pricing arrangement may not be advantageous if a truck carries a load of less than its full capacity.)

An American company, Safety-Kleen Corporation, recently acquired Canam Oil/Breslube. Safety-Kleen is a major solvent reclaimer in the U.S. The effects of the takeover on Breslube's operations have not yet (June 1987) become clear.

## 5.4 MUNICIPAL CARRIERS

Finally, Table 14 examines those carriers in the top 100 who are in fact operated by townships (14) and urban municipalities (1--Metro Toronto). These 15 municipal entities account for only 5% of all shipments, and 6% of all waste tonnages in Ontario--a disproportionately small percentage considering they constitute 15% of the top carriers. With one exception these townships are located in the central and southeastern regions, where they constitute 32% and 40% of the top carriers in those regions, respectively.

Municipalities in Ontario transport two main liquid wastes: dust suppressant and landfill leachate. The Township of Cramahe (Castleton, Ontario), for

example, hauls one subject waste, "road binder" or "road liquor".* The Township has 250 kilometres of gravel roads which are treated with this liquid during the summer months. Road binder is collected free of charge from Domtar's plant in Trenton. (Domtar in Trenton is the third largest subject waste generator in Ontario; in 1986 almost 4,000 shipments totalling 51,167 tonnes originated from the company.**)

One dump truck is fitted by Cramahe for this purpose with a 2000 gallon tank; in winter the tank is removed and this vehicle reverts to other seasonal duties. The Township thus utilizes its existing capacity and manpower rather than hiring a private carrier for this task. The regional configuration of townships in the top 100 carriers (in central and southeast regions, Table 14) suggests that many of these carriers are engaged in the same activity, sourcing from the Trenton plant.

The other main subject liquid waste carried by townships is landfill leachate, from landfill or treatment sites which they operate. Indeed, six municipal entities (counties, regional municipalities, or urban centres) are on the list of the top 50 subject waste generators in Ontario. The fact that only one of these six generators (Metro Toronto) is on the list of the top 100 carriers is significant--these large generators clearly contract out disposal to private carriers. Leachate is hauled to the nearest water pollution control plant in the vicinity, for end disposal.

Metro Toronto transports all leachate from its Pickering landfill site (13,440 tonnes) with one 5,000 gallon tank unit, operating daily.***

Metro's labour force is unionized, and objects to any suggestion that this activity be contracted out.*** In addition, it is hard to stipulate carrier specifications and load frequencies because leachate is produced irregularly and must be hauled on an ad hoc basis. Both of these factors contribute to Metro's transporting its own subject liquid waste.

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* pers. comm. Ms. Peggy Caza, Township of Cramahe office.
** MOE listing of the top 50 generators (by tonnage) in 1986
*** pers.comm., Mr. F.J. Horgan, Municipality of Metro Toronto

The costs to the generator of transporting its own liquid wastes can be higher than if it is contracted out to a transportation specialist. Toronto's experience with solid waste illustrates this point. Metro contracts out about one-half of its solid wastes to private carriers via a tendering procedure. The union resists each time tenders are invited.

Contracts are let for a five year period; new equipment requirements, a letter of credit and/or a performance bond are required of the carrier. Even with these requirements contracting out to private carriers is still about 15% cheaper than internal operations.

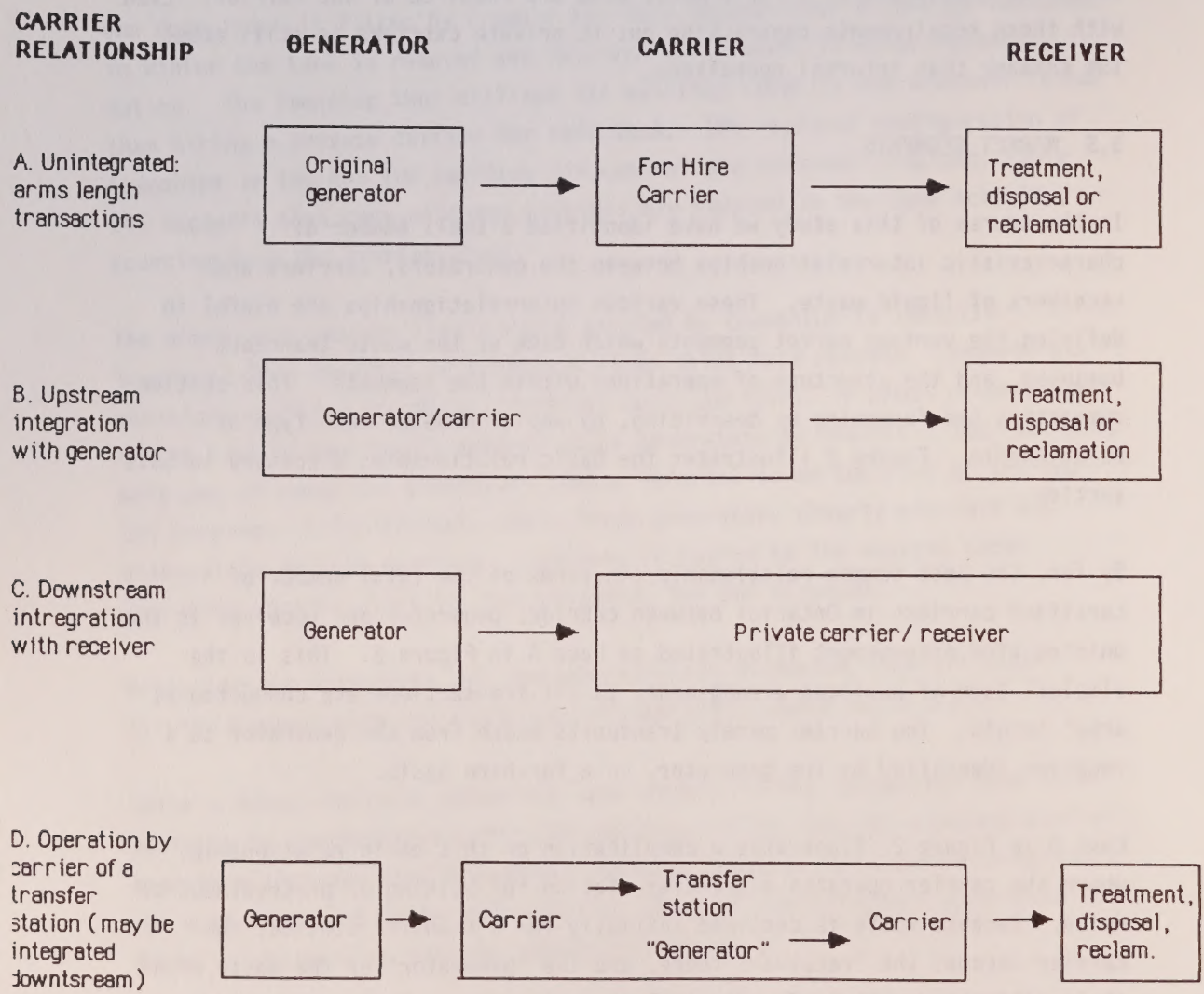
## 5.5 MARKET SEGMENTS

In the course of this study we have identified a small number of characteristic interrelationships between the generators, carriers and receivers of liquid waste. These various interrelationships are useful in defining the various market segments which make up the waste transport business, and the structure of operations within the segments. This section summarizes the foregoing by describing, by way of models, each type of relationship. Figure 2 illustrates the basic relationships discussed in this section.

By far, the most common relationship (in terms of the total number of certified carriers in Ontario) between carrier, generator and receiver is the unintegrated arrangement illustrated as Case A in Figure 2. This is the simplest form of business arrangement, as all transactions are conducted at arms' length. The carrier merely transports waste from the generator to a receiver identified by the generator, on a for-hire basis.

Case D in Figure 2 illustrates a complication on this basic relationship, where the carrier operates a transfer station for bulking or pretreatment of waste. Because waste is destined initially for a transfer station, the carrier becomes the "receiver" there, and the "generator" of the waste when it is ultimately sent on for disposal or reclamation. This carrier may operate either on a for-hire basis, or receive revenue from the sale of wastes for reclamation/reuse, or both.

## FIGURE 2
## SEGMENTS IN THE LIQUID WASTE TRANSPORT INDUSTRY



Case B and C in Figure 2 illustrate carrier integration "upstream" (with generator) or "downstream" (with receiver), respectively. These cases have been examined in detail, with case studies, in Section 5.3 above.

In practice waste streams are characterized by various interrelationships between carriers, generators and receivers. Some firms operate under combinations of relationships A through D. The majority of the more than 400 certified carriers in Ontario are characterized by Relationship A. However, as we have noted previously in our discussion of the Table 14, a relatively small number of integrated carriers handle a disproportionately large quantity of the total subject waste transported in Ontario.

## 6. TRANSPORTATION COSTS AND FEES

The cost of operating a truck can vary considerably depending on a number of operational factors. Some of the more important operational factors include:

- o distance of hauls;
- o type of products and required equipment;
- o size of load;
- o special safety and handling problems; and
- o opportunity for back haul.

In the Pilorusso Research Associates study for the Ontario Waste Management Corporation (OWMC), Transportation of Special Wastes in Ontario (1983), the authors indicated that the transportation of liquid industrial waste is extremely competitive with the "dominant selection criteria used by the generators being price" (p.78). That study concentrated on the for-hire sector of carriers, where the carriers did not become involved in reclamation or treatment (as opposed to the private carrier sector). In such a case, for the generators, the removal of waste is an unproductive cost of doing business and therefore they look to the lowest cost of service. Accordingly, the carriers respond to the generators by trying to offer the lowest charge for transportation of liquid industrial waste.

The Pilorusso report goes on to state that transportation fees for liquid industrial waste haulage are based on time rather than volume or distance. The survey revealed a wide range of charges for haulage. Fees varied from $55.00 to $96.50 per hour, with an average of $72.00 per hour in 1983. This wide variation is attributable to differences in equipment being offered as well as local competitive conditions (p.79).

In another study for the OWMC, entitled Transportation--Primary Information OWMC Facilities Development (1982), the Proctor & Redfern Group of consultants reviewed the haulage costs for wastes and reported a wide variety of factors affecting fees. Aside from normal operating expenses (wages, fuel, maintenance), the report cited additional criteria including (p.14):

- o type of material to be transported;
- o origin and destination of material to be transported;
- o loading and unloading time;
- o frequency of delivery (e.g. weekly, daily);
- o the need to dedicate equipment for the transport of specific substances (e.g. toxic waste); and
- o the quantity of material to be shipped.

The report goes on to state that "haul costs are very sensitive to market conditions, types of materials and quantity transported" (p.14). To support this statement, the report quotes costs in 1982 which are reproduced in Table 16. As we can see, the costs vary depending on the nature of the materials handled. For example, the cost of moving caustic soda is more than twice that charged for fertilizer solutions or sulfuric acid. Similarly, the costs of vehicle rentals vary depending on the material handled; for example, the cost for a vehicle carrying voranol is nearly 50% more than the cost of hiring a vehicle dedicated to moving ammonia.

These studies indicate that there is no simple or direct way to determine how transportation fees for liquid industrial waste are set. Prices for similar products vary widely across the province and are determined by local market conditions. A number of factors--such as those cited above--influence costs (and customer prices) in the industry.

## TABLE 16

### Typical Haul Costs for Materials

| Description of Items | | | Cost |
|---|---|---|---|
| 1. Cost per ton - minute of operation (prices vary by type of material and location) | | | 9c. to 13c. |
| 2. Cost per ton - mile of operation (prices vary by type of material and location) | | | 11c. to 18c. |
| 3. Vehicle standing time when loading or unloading of material exceeds one hour | | | $34.00 /hr. |
| 4. Dedicated vehicle rentals | | Tractor | Trailer |
| - voranol | | $1.72/mi | $1,300.00/month |
| - ammonia | | $1.20/mi | $ 850.00/month |
| - synthetic resin (2100 cu.ft) | | $1.72/mi | $ 825.00/month |

5. Sample Material Haul Tariff

| Material | From | To | Costs * |
|---|---|---|---|
| Caustic Soda | Sarnia | Toronto | $1.465/100 lbs |
| Sugar | Oshawa | Leamington | $ .88/100 lbs |
| Fertilizer solutions | Niagara Falls | Toronto | $ .55/100 lbs |
| Sulfuric Acid | Niagara Falls | Toronto | $ .65/100 lbs |
| Crude Oil | Windsor | Toronto | $ 1.34/100 lbs |

Notes:

1. Costs based upon minimum loads: from 50,000 lbs. (25 short tons)
   to 80,000 lbs. (40 short tons)
2. 3% Gasoline surcharge is added to all shipments
3. Tariffs are typically expressed in Imperial Units as of January, 1982.

* Source: Proctor & Redfern Group, Transportation--Primary Information, for OWMC, (1982).

There are two additional factors which are significant in determining fee levels for various wastes, in various locations. First, whether or not the waste has value after treatment (i.e., through reuse, reclamation, or recycling) has a major impact on what some carriers charge (or pay) for waste. Second, the degree of competition and market conditions in the industry--that is, at a particular location, or for a particular waste--sets limits on the fees that a carrier can charge.

Since the carriers are not required to file a tariff with the Ontario Highway Transportation Board, each transaction between generator and carrier for the removal of liquid waste is done without creating a public record. Thus, any evidence we could obtain regarding prices is anecdotal, and would be misleading in terms of representing the industry as a whole. Without this detailed information it is not possible to determine such issues as price discrimination or market power.

Having said that, obviously we are unable to determine what volume of liquid waste is "economic" to haul. After all, some materials the generators pay the carriers to remove, while for other materials the carriers will pay the generator for the waste products. In the former case, the "economic" value of the waste to the carrier is zero and thus he has to be paid to remove it. In this situation, the transporter typically charges an hourly rate for the vehicle. One southern Ontario operator cited rates of $69.50/hour for a 2,500 gallon tank, and $93.50/hour for a 5,000 gallon tank. This charge is for transportation only; the carrier charges a direct disposal charge to the generator but this is a "flow through" expense charged directly to the client and comprised of the receiver's exact charge. One northern operator indicated charges for a tank of approximately 3,000 gallons of $75-$80/hour. This operator, however, transports large quantities of non-subject liquid waste for a large local generator at $55/hour. This rate is set by the generator, the only large industrial generator in the region. This waste constitutes 93% of the carrier's total annual transport business. In this instance, the carrier is willing to accept a lower fee because of the large volumes involved.

In other cases, the "economic" value of the waste to the carrier is positive, and he will pay the generator for the opportunity of removing it--for the carrier can dispose of it at a profit. There are, apparently, cases where integrated carriers haul waste for a generator, to their own transfer-cum-treatment stations; the carriers have developed markets for the subsequently treated (or bulked) waste. In such a case, a carrier has realized revenues from both its upstream and downstream operations. Understandably, these carriers are hesitant to publicize the downstream value of the "wastes". Many generators are, however, actively investigating means to recoup the value of their wastes, or to cut down their waste volumes. As all operators in the waste generator treatment cycle become more sophisticated, such dual revenue situations for carriers will probably not last.

The cost of disposal for any particular potentially recoverable waste may vary widely depending on the degree of its contamination. Near-pure solvents may be purchased outright from generators by carriers. If the same solvent is mixed with another, or if it has a higher solid content, it may still be purchased but at a lower price--because it is more expensive to treat/reclaim. If it is highly contaminated, it may be a pure waste with no revenue potential; the generator will then contract a carrier on a for-hire basis.

Some wastes are particularly problematic in disposal, and the costs of transportation/disposal are commensurate. Generators may pay $500 per drum for the disposal of chlorinated solvent waste (not, it should be noted, PCB wastes). There is only one site in Canada capable of incinerating chlorinated solvent wastes of greater than 2% concentrations--the St. Lawrence Cement Company kiln in Mississauga. The Company only receives wastes from one carrier, SCA Chemical Services of Model City, New York State. When Canadian generators ship their chlorinated wastes to SCA, SCA receives these wastes at a transfer station in New York state, from whence they are trucked to their final incineration sites. Some are trucked to the Mississauga cement kiln, to be incinerated as fuel.

PCBs (as distinct from chlorinated solvent waste) also pose significant problems. There are no final treatment facilities (i.e. very high temperature incinerators) for pure PCBs in Ontario; they are usually stored on location, or shipped to a storage site. Transport/disposal costs are high. Mineral oils adulterated with PCBs are disposed of for about $100/gallon for small (less than 1,000 gallons) volumes, but the price drops for very large volumes to about $8/gallon. New technology has developed in the USA to enable mobile destruction (incineration) units to destroy PCB-adulterated mineral oils on site. This technology is now in use in Ontario, where over the last two years at least three companies have begun to offer this service--(PPM, Rondar, and Sunohio). Their competition should reduce charges for incineration by mobile units.

# 7. OTHER FACTORS AFFECTING THE INDUSTRY

This Section deals with "entry and exit" issues; deregulation and integration; and the influence of regulation on the industry.

## 7.1 ENTRY AND EXIT

There are no published data on the change in the number of firms handling liquid industrial waste. For one thing, many firms handle both liquid and solid wastes, and are thus problematic with respect to any attempt to classify them as carriers of either one or the other. For another, as we indicated earlier, neither Statistics Canada nor the Ontario Ministry of the Environment keep separate tabulations on liquid waste handlers.

We were, however, able to glean some insights into the issues surrounding entry/exit activities from our interviews, which shed some light on the question of movement within the industry. We were able to identify several significant barriers for a firm wishing to enter this business. These are discussed below.

### 7.1.1. High Capital Cost

Liquid industrial waste tankers are specialized units which can run in excess of $150,000 each. This is a substantial hurdle for any operator entering the business, especially if the equipment must be dedicated to one particular waste--thereby limiting its potential market. Because the equipment must be so specialized, leasing may not be an option. At the same time, small operators may find it difficult to purchase such equipment due to limited access to capital. Commercial banks may not be inclined to finance outright purchases of such vehicles because in the event of default the bank could have a difficult task in locating a suitable new buyer for such a specialized truck.

### 7.1.2 Waste Management System Certificates of Approval

Some industry representatives feel that the Ontario Ministry of the Environment does not give licenses for liquid waste haulage easily and readily and, thus, potential new entrants to the industry are frightened off by what they **perceive** to be a long procedure to acquire a license to operate. We have not ascertained whether these views accurately reflect the facts or whether they are representative of the views of the industry as a whole.

### 7.1.3. Qualified Managers and Operators

According to comments made during the interviews, industry sources feel that because of the specialized nature of the industry, managers require a relatively high degree of business and professional expertise in order to make decisions regarding large capital expenditures and marketing. They must also have expertise in the handling and treatment of the wastes their companies haul. Also, these sources feel that truck operators require specialized training in order to be able to comply with the regulations affecting the shipment of dangerous goods.

The discussion above suggests that there have not been many new entrants in recent years. Regarding the exit of firms, we were told that the liquid industrial waste industry is undergoing rationalization similar to that occurring in the trucking industry in general in response to deregulation. Some smaller firms are being acquired by larger operations for purely competitive reasons, allowing them to engage in integrated operations; some firms of equal size are merging to meet the new competitive situation. The degree to which this rationalization is taking place is not quantifiable, according to industry experts.

## 7.2 DEREGULATION AND INTEGRATION

With the advent of deregulation in transportation in general, industry officials have told us that the industry will see more integration towards "downstream" activities. That is, carriers will attempt to enter the related business of operating disposal sites, with the carriers having the opportunity of charging both for the haulage and disposal of waste. One example in this regard is the highly successful operations of Laidlaw Transportation Inc. which is now actively in the business of providing disposal locations. From that corporation's point of view, it appears to offer a competitive advantage to its generating customers by assuring them of a disposal location, especially since the number of suitable disposal sites in Ontario will not increase at the same rate as the increase in waste volumes, in the face of environmental concerns by local groups (i.e. the "not in my backyard" syndrome). As acceptable sites diminish in number, the transport carrier who can guarantee disposal will have the upper hand on its competition. Indeed, failure to obtain local approval for treatment or bulking facilities (i.e. a transfer station) has been cited by one northern operator as a constraint on the expansion of local operations.* In that case, local opponents combined to defeat the operator's proposal to develop a transfer station in a local industrial park.

## 7.3 INFLUENCE OF REGULATORY FACTORS

Our interviews indicated that regulatory changes increase the cost of operations for a typical firm in the industry. Specific factors are discussed below.

### 7.3.1 Documentation

The requirements for increased documentation to be supplied to all levels of government, the so-called "paper burden", adds to administrative costs and also can delay shipments before or during transit.

Canam Oil/Breslube, the large waste oil carrier/recycler, estimates that it costs 5 cents per gallon handled or $2 million per year given Breslube's volume, to comply with all paperwork, shipment manifests and regulatory requirements, including testing of received wastes.** We have not attempted to verify the accuracy of these figures nor to determine the extent to which they may reflect compliance costs for other firms in the industry. Most waste carriers pass on the additional costs of transport and handling to their customers by way of higher fees. Breslube, whose ability to compete with others in the oil products market is dependent upon the world crude oil price, cannot pass additional costs on to its downstream customers when the oil price is low and competition with "new" oil is stiff (as at present).

For unintegrated or basic for-hire carriers, however, higher costs associated with paper burden should not affect their competitive positions, as all carriers are equally affected.

### 7.3.2 Training

The new regulations under the Transportation of Dangerous Goods Act and Ontario Regulation 309 require specialized operator training which is borne by the industry. OTA officials estimate that training costs in Ontario alone amount to an additional $2 million burden to the trucking industry as a whole.

### 7.3.3 Equipment

As new safety and environmental protection features are added to the specifications for tank carriers, the cost of outfitting a firm with the latest approved equipment has added capital costs and associated financing costs. We were unable, however, to find any estimates of the extent of these added costs.

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* pers. comm., Mr. H. Lindsay, Val Caron, Ont.
** pers. comm., Mr. L.S. Schofield, Canam Oil Services

### 7.3.4 Insurance

The Ministry of the Environment requires all waste management vehicles to have liability insurance coverage of a minimum $1 million. In practice, most operators opt for a greater degree of coverage, if they can afford it.

Many generators insist that their carriers have a higher level of coverage than what the Ministry stipulates. Many of these generators are U.S.-based companies, where this practice originated after cases where they were forced to pay for their carriers' accidents. One large Ontario integrated carrier indicated to us that one of its clients required it to have $5 million in liability insurance; the client company had to waive this rule when this carrier could only obtain $2 million coverage.

The costs of liability insurance have increased enormously in the past two to three years in every type of business. Some carriers indicated to us an increase in premiums in 1986 of 300% with yet higher levels of deductibles. One southern Ontario carrier indicated that his company's premium has risen over the last four years from $8,000 for $5 million coverage, to $100,000 for $2 million coverage.

Insurance for environmental impairment is a new development and outgrowth of Part IX of the **Environmental Protection Act**, or the "Spills Bill", which requires the carrier to pay for environmental clean-up and damages to third parties.*

To date, Canadian insurance companies have not offered the trucking industry coverage for environmental impairment and, as a result, the individual carriers are, in effect, self-insurers, i.e. they pay for any environmental clean-up resulting from waste products spilling into the environment. Self-insurance is, naturally, the most costly form of insurance and has added to the overall cost of operations.

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* For a discussion of the impact of the "Spills Bill" on truckers, see Ontario Trucking Today, "Remember the Spills Bill?", May/June, 1987.

### 7.3.5. Generator Requirements

The generator's cradle-to-grave responsibility for wastes has been taken very seriously by leading corporate generators. Beyond the obvious reason of good corporate citizenhood, there are two compelling reasons for this:

- **Corporate Liability.** Generators are ultimately responsible for how their wastes are disposed of. If problems occur, the Company will have to pay to rectify them.
- **Public Relations.** A dangerous spill, leak or accident, or inadequate treatment, at any point after the waste leaves the generator's premises can come back to reflect upon the generator.

Above (Section 7.3.4), we cited the fact that generators are beginning to require higher levels of liability insurance coverage by carriers. In addition, some generators conduct their own site inspections of the prospective carrier's facilities and equipment, and assess the carrier's safety procedures. Northern Telecom, for example, is preparing its own criteria for carriers (and disposal sites), and will in future conduct environmental performance audits to develop an approved list of carriers for the firm's various locations. Carriers' insurance coverage and assets will also be examined.*

Generators are also actively investigating means to reduce the volume of their waste which must be moved off their premises. This trend has dual purposes--to reduce the quantity of waste which carriers must transport, and to recoup value from the waste by internal recycling.

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*pers. comm., Mr. T.W. Sorokopas, Environmental Management Corp., and Mr. D.T. MacLeod, Northern Telecom.

## Glossary of Terms

### For-hire vehicles

Transportation vehicles hired by a waste generator to transport waste products to a transfer station or disposal site.

### Private Carriers

Transportation vehicles owned by a generator and used to transport that generator's waste products to a transfer station or disposal site.

### Bulking

The storing of the same waste product from two or more generators in a transfer station until such times as the quantity stored is sufficiently large to make it economically efficient to transport to a disposal site.

### Up-stream and Down-stream operations

Up-stream operations refer to the generation of waste products in an industrial activity. Down-stream operations refer to the disposal of waste products by either a carrier or disposal operator.

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# APPENDIX 1

## SHIPMENT MANIFEST

Ontario

Ministry of the Environment / Ministère de l'Environnement

# MANIFEST / *MANIFESTE*

"Regulation 309, R.R.O. 1980, Form 1." / *"Règlement 309, R.R.O. de 1980, formule 1."*

CONFORMS TO TRANSPORTATION OF DANGEROUS GOODS REGULATIONS UNDER THE TDG ACT CHAPTER 36, SC 1980

CONFORMÉMENT AU RÈGLEMENT SUR LE TRANSPORT DES MARCHANDISES DANGEREUSES EN APPLICATION DE LA LOI SUR LE TMD CHAPITRE 36, SC 1980

(Instructions on Reverse) / (*Instructions au verso*)

**A** Generator (Consignor) / *Producteur (Expéditeur)*

Generator Registration No. / *N° d'inscription du producteur* (Provincial No.) / (*N° provincial*)

Company Name / *Nom de la compagnie*

Head Office Address / *Adresse du siège social* — City / *Ville* — Prov. — Postal Code / *Code postal*

Shipping Site Address / *Adresse du lieu d'expédition*

City / *Ville* — Prov. — Postal Code / *Code postal*

Intended Receiver (Consignee) / *Récepteur (Destinataire) prévu* — Receiver No. / *N° du récepteur* (Provincial No.) / (*N° provincial*)

Receiving Site Address / *Adresse du lieu de réception*

City / *Ville* — Prov. — Postal Code / *Code postal*

**B** Carrier / *Transporteur*

Certificate of Approval No. / *N° de certificat d'approbation* (Provincial No.) / (*N° provincial*)

Company Name / *Nom de la compagnie*

Address / *Adresse*

City / *Ville* — Prov. — Postal Code / *Code postal*

| Registration / *Enregistrement* | License Plate No. / *N° de plaque d'immatriculation* | Prov. / *Prov* |
|---|---|---|
| Vehicle / *Véhicule* | | |
| Trailer # 1 / *1re remorque* | | |
| Trailer # 2 / *2e remorque* | | |

Point of entry / *Point d'entrée* — Point of exit / *Point de sortie*

Carrier Certification: I declare that the information contained in Section B is correct and complete. / *Déclaration du transporteur: J'atteste que les renseignements inscrits à la partie B sont exacts et complets.*

Name of Driver (print) / *Nom du conducteur (lettres moulées)* — Tel No. (Area Code) / *N° de tél. (ind. rég.)*

Signature — Day / *Jour* — Mon / *Mois* — Yr. / *An*

Circulation No. (Quebec only) / *N° de circulation (réservé au Québec)*

Other Manifest Number(s) / *Autre(s) numéro(s) de manifeste(s)*

**C** Receiver (Consignee) / *Réceptionnaire (Destinataire)*

Receiver No. / *N° du réceptionnaire* (Provincial No.) / (*N° provincial*)

Company Name / *Nom de la compagnie*

Address / *Adresse*

City / *Ville* — Prov. — Postal Code / *Code postal*

Receiving Site Address / *Adresse du lieu de réception*

City / *Ville* — Prov. — Postal Code / *Code postal*

Date Received / *Date de réception* Day / *Jour* Mon. / *Mois* Yr. / *An* — Time / *Heure* — A.M. — P.M.

| Physical State (Solid, Liquid, Gas) / *État physique (Solide, liquide, gaz)* | Shipping Name of Waste / *Appellation réglementaire des déchets transportés* | Waste Identification No. / *N° d'identification des déchets* — Provincial | TDGA (TMD) | Quantity Shipped / *Quantité expédiée* | Units L / kg / *Unités* | Classification | Packing Group / *Groupe d'emballage* | Concentration | Low Limit (Quantity present) | Packaging Contents — No. / *N° de contenants* | Codes (if any) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Special Handling Emergency Instructions / *Instructions spéciales de manutention ou en cas d'urgence* — Attached / *Annexées* ☐ — Below / *Ci-dessous* ☐

| Quantity Received / *Quantité reçue* | Units L / kg / *Unités* | Identify Any Shipment Discrepancy. Problems. Attach addendum if necessary. / *Indiquer toute différence relative à l'expédition. Annexer une feuille au besoin.* | Handling Code / *Code de manutention* | Decontamination — Packaging Comments Yes / *Oui* | Decontamination — Packaging Comments No / *Non* | Decontamination — Vehicle Yes / *Oui* | Decontamination — Vehicle No / *Non* |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

If handling code "other" specify / *Si le code de manutention est "autre", préciser*

If waste to be transferred specify intended company name / *Si les déchets doivent être transférés préciser le nom du destinataire* — Receiver No. (Provincial No.) / *N° du récepteur* (*N° provincial*)

Address / *Adresse* — City / *Ville* — Prov.

Receiver (Consignee) Certification: I declare that the information contained in Section C is correct and complete. / *Déclaration du réceptionnaire (destinataire): J'atteste que les renseignements inscrits à la partie C sont exacts et complets.*

Name of Authorized Person (print) / *Nom de la personne autorisée (lettres moulées)*

Signature — Tel No. (Area Code) / *N° de tél. (ind. rég.)*

Date Shipped / *Date d'expédition* Day / *Jour* Mon. / *Mois* Yr. / *An* — Time / *Heure* — A.M. — P.M.

Scheduled Arrival Date / *Date d'arrivée prévue* Day / *Jour* Mon. / *Mois* Yr. / *An*

Generator (Consignor) Certification: I declare that the information contained in Section A is correct and complete. / *Déclaration du producteur (expéditeur): J'atteste que les renseignements inscrits à la partie A sont exacts et complets.*

Name of Authorized Person (print) / *Nom de la personne autorisée (lettres moulées)* — Signature — Tel No. (Area Code) / *N° de tél. (ind. rég.)*

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# APPENDIX 2

## SUBJECT WASTE CLASSIFICATION

## ONTARIO MINISTRY OF THE ENVIRONMENT

## WASTE CLASSES, JANUARY, 1986

## INORGANIC WASTES

| | | EXAMPLES |
|---|---|---|
| **Acid Solutions** | | |
| 111 | Spent pickle liquor | Acid solutions of sulphuric and hydrochloric acids containing ferrous salts from steel pickling. |
| 112 | Acid solutions, sludges and residues containing heavy metals | Solutions of sulphuric, hydrochloric and nitric acids containing copper, nickel, chromium, zinc, cadmium, tin, lead, or other heavy metals; chromic acid waste; acidic emission control sludges from secondary lead smelting. |
| 113 | Acid solutions, sludges and residues containing other metals and non-metals | Solutions of sulphuric, hydrochloric, hydrofluoric and nitric acids containing sodium, potassium, calcium, magnesium or aluminum; equipment cleaning acids; cation regenerant; reactor acid washes; catalyst acid and acid washes. |
| 114 | Other inorganic acid wastes | Off-specification acids; by-product hydrochloric acid; dilute acid solutions; acid test residues. |
| **Alkaline Solutions** | | |
| 121 | Alkaline solutions, sludges and residues containing heavy metals | Metal finishing wastes; plating baths; spent solutions containing metals such as copper, zinc, tin, cadmium; case hardening sludges; spent cyanide destruction residues; dewatered solids from metal and cyanide finishing wastes and cyanide destruction. |
| 122 | Alkaline solutions, sludges and residues containing other metals and non-metals, not containing cyanides | Alkaline solutions from aluminum surface coating and etching; alkali cleaner wastes; waste lime sludges and slurries; anion regenerants. |
| 123 | Alkaline phosphates | Bonderizing wastes; zinc phosphates; ferrous phosphates; phosphate cleaners. |
| **Aqueous Salts** | | |
| 131 | Neutralized solutions, sludges and residues containing heavy metals | Metal finishing waste treatment sludges containing copper, nickel, chromium, zinc or cadmium; neutral salt bath sludges and washes; lime sludge from metal finishing waste treatment; dewatered solids from these processes. |
| 132 | Neutralized solutions, sludges and residues containing other metals | Aluminum surface coating treatment sludges; alum and gypsum sludges. |
| 133 | Brines, chlor-alkali sludges and residues | Waste brines from chlor-alkali plants; neutralized hydrochloric acid; brine treatment sludges; dewatered solids from brine treatment. |
| 134 | Wastes containing sulphides | Petroleum aqueous refinery condensates. |
| 135 | Wastes containing other reactive anions | Wastes containing chlorates; hypochlorite; bromate or thiosulphate. |
| **Miscellaneous Inorganic Wastes and Mixed Wastes** | | |
| 141 | Inorganic wastes from pigment manufacturing | Wastewaters and sludges from the production of chrome yellow, molybdate orange, zinc yellow, chrome green and iron pigments; dewatered solids from these sources. |
| 142 | Primary lead, zinc and copper smelting wastes | Slurries, sludges and surface impoundment solids; treatment plant sludges; anode slimes and leachate residues; dewatered solids from these sources. |
| 143 | Residues from steel making | Emission control sludges and dusts; precipitator residues from steel plants; dewatered solids from these sources. |
| 144 | Liquid tannery waste sludges | Lime waste mixtures; chrome tan liquors; dehairing solutions and sludges. |
| 145 | Wastes from the use of paints, pigments and coatings | Paint spray booth sludges and wastes; paper coating wastes; ink sludges; paint sludges. |
| 146 | Other specified inorganic sludges, slurries or solids | Flue gas scrubber wastes; wet fly ash; dust collector wastes; metal dust and abrasives wastes; foundry sands; mud sediment and water; tank bottoms from waste storage tanks that contained mixed inorganic wastes; heavy sludges from waste screening/filtration at transfer/processing sites not otherwise specified in this table. |
| 147 | Chemical fertilizer wastes | Solutions, sludges and residues containing ammonia, urea, nitrates and phosphates from nitrogen fertilizer plants. |
| 148 | Miscellaneous waste inorganic chemicals | Waste inorganic chemicals including laboratory, surplus or off-specification chemicals, that are not otherwise specified in this table. |
| 149 | Landfill leachate | Surface run-off and leachate collected from landfill sites. |
| 150 | Inert inorganic wastes | Sand and water from catch basins at car washes; slurries from the polishing and cutting of marble. |

## ORGANIC WASTES

| | | |
|---|---|---|
| **Non-halogenated Spent Solvents** | | |
| 211 | Aromatic solvents and residues | Benzene, toluene, xylene solvents and residues. |
| 212 | Aliphatic solvents and residues | Acetone, methylethylketone and residues, alcohols, cyclohexane and residues. |
| 213 | Petroleum distillates | Varsol, white spirits and petroleum distillates, thinners. |
| **Fuels** | | |
| 221 | Light fuels | Gasoline, kerosene, diesel, tank drainings/washings/bottoms, spill clean-up residues. |
| 222 | Heavy fuels | Bunker, asphalts, tank drainings/washings/bottoms, spill clean-up residues. |

(over)

| | | |
|---|---|---|
| 231 | Latex wastes | Waste latexes, latex crumb and residues. |
| 232 | Polymeric resins | Polyester, epoxy, urethane, phenolic resins, intermediates and solvent mixtures. |
| 233 | Other polymeric wastes | Off-specification materials, discarded materials from reactors. |
| **Halogenated Organic Wastes** | | |
| 241 | Halogenated solvents and residues | Spent halogenated solvents and residues such as perchloroethylene, trichloroethylene and carbon tetrachloride (dry cleaning solvents); halogenated still bottoms; residues and catalysts from halogenated hydrocarbon manufacturing or recycling processes. |
| 242 | Halogenated pesticides and herbicides | 2,4-D, 2,4,5-T wastes, chlordane, mirex, silvex, pesticide solutions and residues. |
| 243 | Polychlorinated biphenyls (PCB) | Askarel liquids such as Aroclor, Pydraul, Pyranol, Therminols, Inerteen, and other PCB contaminated materials. |
| **Oily Wastes** | | |
| 251 | Waste oils/sludges (petroleum based) | Oil/water separator sludge; dissolved air flotation skimming; heavy oil tank drainage; slop oil and emulsions. |
| 252 | Waste crankcase oils and lubricants | Collected service station waste oils; industrial lubricants; bulk waste oils. |
| 253 | Emulsified oils | Soluble oils; waste cutting oils; machine oils. |
| 254 | Oily water/waste oil from waste transfer/processing sites | Waste oil and oily water limited to classes 251, 252 and 253 that have been bulked/blended/processed at a waste transfer/processing site. |
| **Miscellaneous Organic Wastes and Mixed Wastes** | | |
| 261 | Pharmaceuticals | Pharmaceutical and veterinary pharmaceutical wastes other than biologicals and vaccines; solid residues and liquids from veterinary arsenical compounds. |
| 262 | Detergents and soaps | Laundry wastes. |
| 263 | Miscellaneous waste organic chemicals | Waste organic chemicals including laboratory surplus or off-specification chemicals that are not otherwise specified in this table. |
| 264 | Photoprocessing wastes | Photochemical solutions, washes and sludges. |
| 265 | Graphic arts wastes | Adhesives; glues; miscellaneous washes; etch solutions. |
| 266 | Phenolic waste streams | Cresylic acid; caustic phenolates; phenolic oils; creosote. |
| 267 | Organic acids | Carboxylic or fatty acids; formic, acetic, propionic acid wastes; sulphamic and other organic acids that may be amenable to incineration. |
| 268 | Amines | Waste ethanolamines; urea; tolidene; Flexzone waste; Monex waste. |
| 269 | Organic non-halogenated pesticide and herbicide wastes | Organophosphorus chemical wastes; arsenicals; wastes from MSMA and cacodylic acid. |
| 270 | Other specified organic sludges, slurries and solids | Tank bottoms from mixed organic waste bulking tanks at waste transfer sites; mixed sludges from waste screening/filtration at waste transfer/processing sites not otherwise specified in this table. |
| **Processed Organic Wastes from Transfer Stations** | | |
| 281 | Non-halogenated rich organics | Blended/bulked non-halogenated solvents, oils and other rich organics prepared at transfer/processing sites for incineration. |
| 282 | Non-halogenated lean organics | Blended/bulked aqueous wastes prepared at transfer/processing sites for incineration and contaminated with non-halogenated solvents, non-halogenated oils and other non-halogenated organics. |
| **Plant and Animal Wastes** | | |
| 311 | Organic tannery wastes | Fleshings; trimmings; vegetable tan liquors; Bate solutions. |
| 312 | Pathological wastes | Human anatomical waste; infected animal carcasses; other non-anatomical waste infected with communicable diseases; biologicals and vaccines. |

## OTHER WASTES

| | | |
|---|---|---|
| **Explosive Manufacturing Wastes** | | |
| 321 | Wastes from the manufacture of explosives and detonation products | Wastewater treatment sludges; spent carbon; red/pink waters from TNT manufacturing; residues from lead base initiating compounds. |
| **Compressed Gases** | | |
| 331 | Waste compressed gases | Methane (natural gas); nitrous or nitric oxides; propane; butane |

# APPENDIX 3

FLEET CHARACTERISTICS OF A SAMPLE OF CERTIFIED CARRIERS

44 certified waste carriers selected from MOE carrier certification records; See Section 4.2 of the Report)

APPENDIX 3

FLEET CHARACTERISTICS OF A SAMPLE OF 44 CERTIFIED CARRIERS, BY M.O.E. REGION

| Carrier | SOUTHWEST | | | | WEST CENTRAL | | | | CENTRAL | | | | SOUTHEAST | | | | NORTHERN | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) |
| 1 | 100% | 3 | vac. trucks | 6,000 | 100% | 3 | tanker trucks | 4,500 | 100% | 1 | truck | 2,620 | 100% | 3 | vac. trucks | 8,000 | 40% | 5 | trucks/vans for drummed waste | ? |
| | | | | | * 357 manifested shipments totalling 1,816 tonnes in 1986. Average = 5 tonnes. | | | | | | | | | | | | | | | |
| 2 | 10% | 5 | self-pumping trucks | 7,500 | 60% | 4 | tankers | 20,000 | 100% | 1 | truck | 250 | - | 1 | vac. truck | 4,200 | 20% | 2 | tank trucks | 4,000 |
| | | | | | | | | | | | | | | | | | | 2 | trucks | ? |
| 3 | 10% | 2 | vac. trucks | 5,000 | 100% | 1 | vac. unit | 2,000 | 100% | 2 | vac. trucks | 4,000 | 100% | 3 | trucks | 5,500 | 100% | 3 | trucks | 18,000 |
| 4 | 30% | 3 | vac. trucks | 6,000 | 40% | 2 | vac. trucks | 6,400 | - | 3 | pump trucks | 6,900 | 100% | 12 | trucks for 1-6 45. drums | ? | 100% | 2 | vac. trucks | 2,900 |
| 5 | 100% | 1 | tpt. truck | 8,000 | 100% | 2 | tankers | 8,800 | 30% | 21 | vac. trucks, supersuckers or guzzlers | 20-40 cu.yds. or 2-3,000 gal. | 80% | 1 | straight truck for drummed liquid | ? | 50% | 4 | vac. trucks (2 for sewage) | 8,000 |
| | | | | | * 291 manifested shipments totalling 7,160 tonnes in 1986. Average 25 tonnes. | | | | * 396 manifested shipments totalling 3,344 tonnes in 1986. Average = 8 tonnes. | | | | | | | | | | | |
| 6 | 100% | 1 | tank truck | 1,900 | 90% | 11 | tank/ vac. trailers | 55,000 | - | 3 | vans for return of drummed liquid waste | ? | - | 1 | 16 yd. tandem for solid waste | - | 30% | 1 | 3/4 ton truck for drums | ? |
| | | | | | | 12 | box/ flatbed trailers @ 76 drums each | | | 1 | tractor trailer | ? | | | | | | | | |
| | | | | | | 8 | dumps for solid wastes | | | | | | | | | | | | | |

Continued on following page

## APPENDIX 3 (Continued)

| Carrier | SOUTHWEST: Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | WEST CENTRAL: Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | CENTRAL: Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | SOUTHEAST: Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) | NORTHERN: Liquid Waste as % of Total Waste Carried | # | Type of Equipment/ Vehicles | Firm's Liquid Capacity (Gal) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 50% | 3 | vac/trucks trailers | ? | - | 1 | lugger for solids | - | - | 3 | trucks for solids | - | - | - | fleet mostly for solids; some tanks for leachate | - | 75% | 1 | 1-ton truck for drums | ? |
| | | 1 | trailer for drums | | | | | | | | | | | | | | | | | |
| | * 481 manifested shipments totalling 10,096 tonnes in 1986. Average = 21 tonnes. | | | | | | | | | | | | * 372 manifested shipments totalling 8,238 tonnes in 1986. Average = 22 tonnes. | | | | | | | |
| 8 | 10% | 3 | vac trucks | ? | - | 30 | dumps for solid wastes | - | - | small fleet for solid hazardous wastes | | ? | | | | | 100% | 3 | tankers | 42,000 |
| | | | | | | | | | | | | | | | | | | 1 | 5 ton van for drums | 30 drums |
| | | | | | | | | | | | | | | | | | | 1 | 1/2 ton van for drums | ? |
| 9 | 50% | 5 | vac trucks/ bulk tankers | ? | | | | | - | small fleet for for solid wastes | | ? | | | | | 30% | 5 | 5 ton dumps for solid waste, sludge | |
| | | 3 | trailers for drums | ? | | | | | | | | | | | | | * 41 manifested shipments totalling 1,045 tonnes in 1986. Average = 25 tonnes. | | | |
| | | + | large fleet for solid waste | | | | | | | | | | | | | | | | | |
| 10 | - | 33 | bulk hoppers for solid wastes | - | | | | | | | | | | | | | - | 14 | excavators, loaders, earthmovers for spill cleanups. | - |

Source: Carrier certification files, Ontario Ministry of the Environment. Sample selected randomly by L. Matthews of MOE.

Notes: Certification files vary in degree of detail and completeness. This table has been compiled from that information which is directly available or which can be inferred from file correspondence made available to the consultants. In some cases, lengthy equipment lists have been aggregated into simpler groupings of equipment.

Because there are few large liquid waste carriers in either MOE's Northeastern or Northwestern Regions, we have for the purposes of this report combined the two regions as "Northern".

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THE TRANSPORT OF LIQUID INDUSTRIAL WASTE IN ONTA
1987.

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